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Occasional Paper April 2007 Number 19

NEPAL RASTRA BANK

The Editorial Board, *Economic Review: Occasional Paper* (ISSN 1608-6627), has the pleasure of releasing this eighteenth issue of the Review on the occasion of the 52nd Anniversary of the Nepal Rastra Bank (NRB). This issue incorporates analytical articles from the staff of the NRB and academicians outside the NRB on contemporary issues of the economy.

Though the articles are reviewed by the Editorial Board, the Board does not guarantee the accuracy of the data and analytical results along with their implications. Moreover, the views and interpretations included in the articles are those of the authors' and do not necessarily reflect and represent the views and policies of the NRB. The Editorial Board would also like to thank Mr. Bishnu Prasad Gautam, Assistant Director, Research Department and Mr. Amar Ratna Bajracharya, Supervisor (Computer), Research Department for the valuable assistance in the publication of this issue.

The Editorial Board invites applications of quantitative, econometric, and analytical tools and techniques as developed by the authors of the articles to draw on conclusions and suggestions to be most useful to the readers. Those interested in contributing analytical articles to the Review on any pertinent subject of the economy such as money, banking and finance, trade and balance of payments, government finance, broad-based and sustained economic growth, socio-economic development, etc. are requested to submit the articles for consideration in the forthcoming issues.

Any comments, queries, suggestions, and correspondence should be directed to the Editorial Board.

Finally, for the information of the interested readers, this issue onwards the past contents of the Review will also be included at the end of each issue.

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A Consolidated Effort for Marketing in Commercial Banks

Dr. Parashar Koirala *

Commercial banks in Nepal still appear to be biased towards the traditional practices for the attraction of potential customers. Meeting the needs of potential customers in the 21st century with the knowledge and training of 20th century is a difficult task. Changes in the marketing strategy within a traditional working structure and system have led the banks towards increasing the non-performing loan (NPL). As every sub-system is a part of a system, a small mistake on the loan disbursement process reflects its implication on the loan recovery process. Hence, a new system in loan disbursement and a loan recovery process makes the bank more effective in its operations. In the new system, all the parties involved in decision-making process should be made responsible to their functions and they need to be penalized accordingly if they fail to promote healthy growth of the banking system.

I. INTRODUCTION

A bank's marketing starts with proper relationship with customers either to attract savings or for loan disbursement. Both the depositors and creditors are customers of the banks. Banks offer various products for deposit mobilization and disburse the credit products as per the portfolio management. Customers as per their need purchase different types of products offered in the market. Deposit products offered to the customers are categorized into general products and special products. Mobilization of deposit simply by increasing the rate of interest is termed as general products and special products are developed in terms of schemes generally refundable at a longer period of time. Customers choose the respective better general products and special products from among the products available in the market. Special products focus on some specific value and needs of the customers. Under this come the education scheme for the children, daughter's marriage scheme and retirement pension scheme, among others.

Credit products can be bifurcated into fund based products and non-fund based products. The fund based products in practice are developed from the credit products

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generally known as overdraft, working capital loan, term loan, bills purchase or negotiation, export and import bills, import/trust receipt loan, export credit, loan against fixed deposit receipt, loan against shares, loan against government securities, and loan against bank guarantee and deprived sector loan. The term loan used in practice generally addresses short-term loan, medium term loan and long term loan to be advanced in various forms such as housing loan, hire purchase loan and bridge financing. The non-fund based product is composed of letter of credit (LC) and bank guarantees with different forms (bid bonds, performance bonds, etc.).

II. MARKET

Different types of products developed from deposit products and credit products by the 18 commercial banks, 28 development banks, 67 financial institutions, 5 rural development banks, 19 cooperative institutions, and 47 non government organizations (NGOs) operating limited banking functions are available in the Nepalese market. All these products cover the markets right from the niche market to consortium loan market. However, people in rural area still depend on traditional money lending practices for credit and they have no access to the institutions for depositing their small saving. Most of the banking products available in urban area were the products developed long ago. Hence, there is a need to develop more of these products as per the needs of the people.

Development infrastructure is very poor in Nepal. A limited net-work of roads connects the district headquarters and its extension to the Village Development Committees is a very difficult task for the government since it applies the existing development model with cent per cent government participation. Nepal is rich in water resource possessing high potentiality for hydropower generation; however, it is facing power shortage in winter as well as in summer during the last few years. Electricity in many rural districts is meant for domestic lighting and for conducting office work in the district headquarters. As compared to others, telephone network is better in Nepal. The introduction of the CDMA system of telephone has further enhanced accessibility.

Large-scale firms and middle scale firms have access to banks even if they are established in rural areas. Sugar mills, jute mills, cement factory, lime factory, and mica factory, among others, are set up in rural areas and their access to banks is similar to the factories established in urban areas. The problem of access to banks arises to individual entrepreneurs, cottage and small-scale firms that are established in rural areas. The banks believe that operation in the rural areas swells the transaction costs. The initiation of a study for market extension without increasing the marginal costs has never been considered. This shows the negligence of the banks to extend the market to the rural areas.

Among the different banking products available in the market, the products with high demand are consumer credit, export and import credits, term loan, project loan and syndicate loan. All banks and financial institutions on the basis of their capital base and liquidity position offer these credit products but none of them so far have been found to have expertise in any one of them for marketing. Relying on any one product by portfolio seems more risky. Banks in foreign countries are known to bring out numerous products. As an example, the Bank of America has a vast range of banking businesses serving

individuals and small firms, and a big share of the loan syndicate market.[1] It means markets are there for some products and it is created for others. Banks in Nepal are weak in locating the existing markets and in creating new markets, too.

III. CUSTOMERS

Loan disbursement is a trade of win-win game. Lenders and borrowers both get benefited out of it. Customers, not products, are the ultimate source of income. For the analysis of customers, several questions need to be answered. These include questions such as which customers buy the product and how they use it, where customers buy the product, when customers buy, how customers choose, why they prefer that product, how they respond, and will they buy it again. All these data available in the respective files of the customers make the marketing activities quite easier and effective.

Nepal has factor abundance in tourism, water resources, and medical service industry. For many other sectors, the country faces the competition with India and China. However, the contribution of non-agriculture sector to GDP remained 62% in the year 2005/06. The sub-sectors that fall under the non-agriculture sector are mining & quarrying; manufacturing; electricity, gas & water; construction; trade, restaurants & hotels; transport, communications and storages; finance & real estate; and community and social services. As compared to the contribution of previous year, it increased just by 0.1 %. The manufacturing sector, particularly consisting of cotton and textile factory, is adversely affected by the inflow of cheap clothing from China. Sugar and cement factories and paper mills did not perform well owing to managerial problems. Thus, the non-agriculture sector is not free from a host of problems. Commercial farming by the marginal farmers is becoming popular in the agricultural land with access to road and irrigation facilities. Crop insurance that was supposed to be introduced ten years back has not yet been initiated. Though geographical condition is favorable for horticulture and floriculture farming in Nepal, it is at an infancy stage moving slowly towards commercial farming. However, the loan disbursement by commercial banks to production sector remained always higher over the others starting from 2002/03 to 2005/06. In terms of portfolio management, it covers more than 30 percent of the total loan disbursement in the respective years. The wholesale and retailing business occupies second position utilizing on an average 22 percent of the total disbursed loan during the respective years. The share of service sector so far has remained 10 percent.

In the beginning, there was a dominant role of Marwari Community in the large-scale business and industrial activities in Nepal. The Marwari Community is the professional class for undertaking business activities. The Newars and the Thakalis are the other business groups. The Newars believed in small businesses for sustainability and continuity. Nepalese thinking has changed these days. Every one, irrespective of the community he belongs, who has knowledge on business and some capital, wants to be involved in business. The increasing demand of business education around the world further encourages people to develop some idea on business. So, it is difficult to point out one or two communities representing the whole business sector of Nepal. Another feature of the Nepalese business community is its diversified portfolio management. No

[1] For details, see *The Economist*, July 29-August 4, 2006.

businessman solely depends on one business. Those operating sugar mills possess import license for sugar on the one hand and has real estate business on the other.

Business and finance are interrelated areas depending on their respective activities. In the absence of one party, there is no existence of the other party. It is common interest of both parties to have a win-win game. Parties involved in the win-win game seek to have common interest up to the existence of one party. The sharing of benefits out of the project leads to promote unity among the concerned interested parties. Table 1 shows the benefit matrix of the parties concerned.

TABLE 1: Benefit Matrix

Status	*Benefits*	*Loss due to Project Failure*
Promoters	Participation in management & dividend.	Effect on the life style
Equity holders	Dividend	Effect on the life style
Management	Remuneration and bonus	Effect on the life style
Staff	Remuneration and bonus	Effect on the life style
Customers	Quality product with added value	Availability of product in substitution
Suppliers	Timely payment	Amount of loss
Civil society	Employment opportunity and benefit sharing	Loss of opportunity
Bank	Repayment of loan and interest	Loss of interest and loan amount

A detailed analysis about the causes of project failure and role of stakeholders is needed to rescue the project and enable the bank to understand the behavior of stakeholders. The strategy should be taken to become very much alert in specific projects requiring close monitoring on the sources and uses of fund.

IV. CUSTOMER VALUE

Customers are value maximizers within the bounds of costs and limited knowledge, mobility and income. Customer value is taken in terms of economic value of the customer relationship to the firm or it is expressed on the basis of contribution margin or net profit. Customer's value in bank is assessed in terms of core benefit, basic product, expected product and augmented product. The fundamental benefit that the borrower buys from the bank is the project for operation, not the amount of credit. It is in the joint interest of borrowers and banks to run the project smoothly. From the smooth operation of project both the borrowers and the banks benefit, and thus it is said that they have common interest in running the project. In other words, the project that could not be run effectively, means it may be getting sick. A variety of reasons can be put forth for the sickness of the project: a) operating an unviable project; b) poor management system with absence of professionalism; c) siphoning of credit from one project to other; d) deteriorating condition with respect to the understanding between political parties pleading for social justice; e) worsening external relations; and f) innocent promoters

Many persons and firms are involved right from project development stage to selection of sources of finance and its relevant uses. So, the responsibility of project sickness should not be assigned solely to the promoters. The part of the responsibility of this sickness should also be assigned to the person/firm who had developed the project as a feasible one. As per the degree of involvement of the persons/firms in the decision making process, the consultant/firm should be punished accordingly. In case of necessity, a process of black listing is to be taken into account. Since the consultant/firm starts giving professional services in the form of feasibility study or other consulting services without making compromise with promoters, the problem of project sickness gets minimized.

It is the responsibility of the consultant to bring the banks and borrowers under one table. Hence, for the bank, the consultants/ firms are market makers. Without a project proposal, borrowing from the bank is not possible. The project proposal itself is a kind of application for requesting loan. After assessing the project proposal, the bank approves the amount of credit. The approval of the credit lower than the required amount implies some lacuna in the project proposal. If the project reflects beyond reality, it is better to reject the proposal rather than give approval for a lower volume of credit.

Marketing also includes the behavioral aspect of the staff. In the absence of staff with good behavior, no bank can function efficiently. The augmented product seeks extra benefit from the bank such as discount in interest rate on lending; the staff should be very able to handle and manage such products.

V. MARKET MAKERS

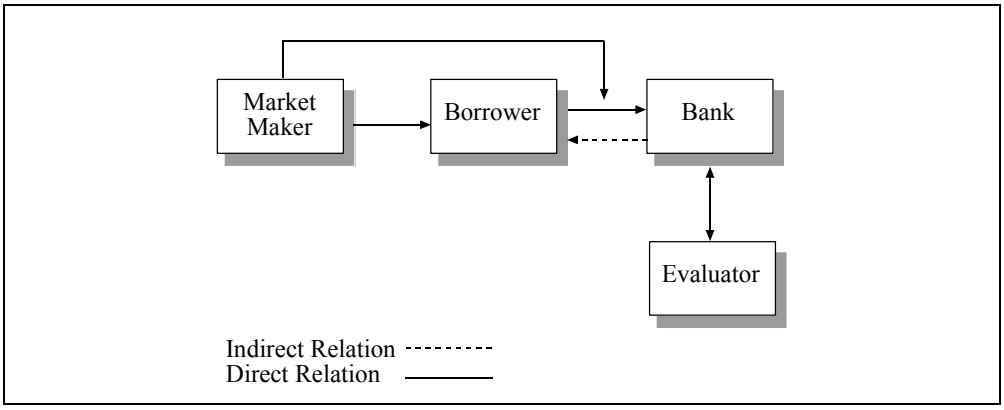
Market makers play an important role in the contract between the borrower and the bank. In principle, it is the duty of the consultant to sell the project on be half of the borrower to the bank. The rejection of a project can raise the question about the knowledge and quality of the consultant. But in Nepal, after the preparation of the project, the duty of the consultant gets over. And, it is the borrower who exercises his personal contact to get the project approved.

Each bank follows some process and system for loan approval and for accepting the deposits. At first, the banks demand a detailed proposal of a project along with an application for loan. The respective loan officer assesses the proposal submitted to the bank and recommends for approval if the proposal is found viable. Normally, only feasible projects are accepted. The preparation of project proposal is a professional job assigned to any consulting firm or organization. The company that needs credit lacks that type of expertise within the organization. To get the bank credit properly and effectively, there is a network of the parties involved in borrowing. These parties are a) borrower, b) consulting firm for project preparation, c) bank and d) consulting firm for collateral valuation.

Till now, the role of the consulting firm has remained very nominal. Once a consulting firm prepares the project report on the basis of the terms of reference provided by the borrower and submits it to the bank, the responsibility of the consultant is over. The bank also uses the service of the consultant for the valuation of the collateral. No single consultant is eligible to handle both the jobs. The consultant becomes free from any obligation after submitting the collateral valuation to the bank for loan approval. In

banking business, these two consulting firms play important roles in facilitating the right decision-making pertaining to the viability of the project and the amount of credit to be approved to the borrower.

FIGURE 1: Network of the Parties Involved in Borrowing



Market makers and borrowers have direct relation with each other (Figure 1). The proposal for project viability prepared by the market maker along with the required credit is submitted to the bank by the project promoter alone or at the time of submission the market makers accompany the project promoter to the bank. The evaluator works under the terms of reference of the bank and recommends the estimated value of the collateral. Nepal Rastra Bank, as the regulator, has an indirect relation with the bank. Depositors, on the other hand, play a crucial role for the growth and survival of a commercial bank. No banks can survive without gaining confidence from the depositors. These depositors should not be confined to their interests only on the interest rate. They should be mobilized to make some indirect control for effective delivery of banking services. Those possessing direct relation should take third parties responsibility on the collection of defaulted loan.

VI. CUSTOMIZATION AND CONVERGENCE

Banking products offered these days are generally very much standardized. As per the type of the product, some of the customers adjust their needs accordingly. Banks do have the experience of working in de-marketing in Nepal. There is no competition in offering products at different interest rates. It looks like a banks' cartel in charging interest on loan and providing interest on deposit. On the basis of customers' survey, banks should develop the respective products and sell them into the market. In this age of new economy, 'knowledge' is termed as a driving force of the economy. Besides, knowledge is taken as factor of production in lieu of land, labor and capital. In a new economy, customers design their products and hand them over to the banks for development and marketing accordingly. In foreign countries, banks differentiate the products, services, prices and delivery channel for each customer. To compete with the foreign banks, the

Nepalese banks have to consider the new challenges and encourage the customers to identify their needs and develop capability to meet such designed needs. A new system in a new economy may be popular among the educated people. For the new economy, it needs to have network that connects potential customers and banks. These networks include the intranet where employees are connected within a bank to one another and to the bank mainframe; extranet where a bank is connected with suppliers and market makers; and the internet where consumers are connected to the worldwide "information repository."[2] The combination of operational customization and marketing customization is called customerization. The process of customization may be very difficult to implement for complex products.

With the passing of time, there should be a change in the models of commercial banks. In the changing context, commercial banks have started to plunge into investment-banking markets. Barriers between banks, insurance companies and securities companies have been gradually reducing allowing the formation of diversified financial groups. Each of the big banks has moved some distance from the traditional banking strategy of holding assets on the balance sheet. Banks in the developed countries have started to use loans as securities and sell them in the capital markets rather than to hold them in the balance sheet. On top of that, the large commercial banks have become buyers and sellers of derivatives, such as credit-default swaps and interest-rate swaps, both for profit and to hedge their other assets and liabilities. In this way, the bank acts as a lender and as a trader. In each stage of business transactions, it needs to have marketing activities. Without proper marketing both in ability and practice, banks may not be able to survive.

VII. CONCLUSION

Banking business looks not free from the bad days when compared with business conditions in global scenario of 15-20 years ago. An effective system for borrowing from bank and an efficient system for its recollection have not yet been developed in Nepal. Beneficiaries from successful outcome of the project are many in number but the failure of project has affected the banks only. Unless all the beneficiaries get united to a system not only for project success but also for the project failure, there will remain a higher level of defaulters. And for promoting the diversified functions of commercial banks, it needs to have integrated marketing efforts applied in all respects. Thus, enhanced marketing and market compatible strategies will not only reduce the problems of the banks but also provide cushion to meet the persisting challenges of the banking system.

[2] For details see Kotler (2005), p. 24.

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Tax Elasticity and Buoyancy in Nepal: A Revisit

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Tax elasticity and buoyancy estimates are the dynamic tools for measuring the tax performance. This study makes a revisit to the studies carried out earlier to measure tax elasticity and buoyancy in Nepal, in the context of the structural changes that have taken place in the tax system in recent years. The main objectives of the study are to measure the elasticity and buoyancy of tax and to ensure whether or not the tax system in Nepal is elastic. The study has applied time series regression approach for this empirical measurement. This study reveals that the tax system in Nepal is inelastic (less than unity) in the period 1975-2005 with a more than unitary buoyancy coefficients, thus reflecting that the bulk of revenue collection emanates from discretionary changes in the tax policy, rather than from automatic responses.

I. INTRODUCTION

Revenue mobilization has a crucial role in fiscal policy implementation, especially in a developing country where the demand of public funds for public expenditure is high. It is a better source of resource mobilization than the other sources such as deficit financing and money creation. As tax revenue is the major source of domestic revenue in Nepal, the measurement of tax elasticity and buoyancy would be very beneficial in terms of reforms in tax structure as well as revenue administration. In addition to this, the study of tax elasticity and buoyancy is also useful for revenue forecasting.

Tax revenue may change due to a variety of factors, such as changes in income, changes in tax rate and tax base, changes in efficiency of tax assessment and collection, among others. The responsiveness of tax revenue to such changes can be explained with the help of tax elasticity and buoyancy. "Tax elasticity may be defined as the ratio of a percentage change in adjusted tax revenue to a percentage change in income i.e. nominal GDP. On the other hand, tax buoyancy refers to changes in actual tax revenues due to the changes in income as well as due to the changes in discretionary measures such as tax rates and tax bases"(Mukul, 1977, p. 63). This distinction between the tax elasticity and buoyancy is very useful in analyzing and evaluating whether future revenues will be

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sufficient to meet the resource needs without changing the rates or bases of the existing tax. To measure the tax elasticity, historical tax series must be adjusted so as to eliminate the effects of tax revenues from discretionary changes. If there is no change in the tax rates and the tax base during the reference period, the buoyancy will be the same as elasticity.

Against this background, this study attempts to utilize the time series approach to empirically estimate the tax elasticity and buoyancy in Nepal for the period 1975 – 2005. The major components of tax revenue such as import duties, value added tax (VAT), income tax and excise duties are scrutinized. For the period prior to the launch of the VAT, the sum of sales tax, contract tax, entertainment tax and hotel tax is used for the elasticity estimation.

Alternatively, the buoyancy and the elasticity of tax revenues are also estimated by applying the partitioning approach. "Under this approach, tax elasticity and buoyancy coefficients are partitioned into tax to base and base to income components" (*Ibid*, p.66) In other words, tax elasticity and buoyancy are estimated with respect to the gross domestic product (GDP) as well as their respective proxy bases. "An advantage of using such a partitioning approach is the ability to identify factors responsible for rapid or lagged revenue growth. Factors that affect the tax to base elasticity such as tax rates, exemptions and improvements in tax administration are within the control of the fiscal authorities, thereby making this measure important for related purposes. The base to income elasticity, on the other hand, is determined largely by the way in which the economic structure responds to growth" (Yuthika, 1991, p. 76)

The study is organized as follows. With this introductory part, the second section highlights the rationale of the study as well the objectives. The third section discusses the data sources and limitations, the adjustment procedures, and the method of calculating the elasticity and the buoyancy. The fourth section discusses the methodology of the study. The fifth section presents the results while the last section draws the conclusion.

II. RATIONALE AND OBJECTIVES OF THE STUDY

Though several research studies were carried out in the past, it is very useful to revisit tax elasticity and buoyancy in the present scenario. A number of changes have taken place in the taxation front in Nepal in recent years. The VAT has come into enforcement and its rate has been changed twice. Income tax rates were changed many times and a new Income Tax Act was launched in 2002. Customs slabs and rates have been revised frequently. Many other tax reform measures have been applied in the recent years. This study of tax elasticity and buoyancy will thus be beneficial for tax planning and fiscal projection in the present Nepalese context.

Most of the earlier studies have followed a traditional approach to calculate elasticity and buoyancy of several taxes. Under this approach, tax revenue is assumed as a function of the GDP, which may not always reflect the clarity of the results in all the cases. For instance, revenue from import duties does not directly depend on the level of GDP. Rather, it depends on the value of import which in turn depends on the level of GDP. There is an indirect relationship between these variables. To see this type of relationship, it is recommended worldwide to follow the partitioning approach while estimating elasticity and buoyancy, rather than pursue the traditional approach. "An advantage of

using such a partitioning approach is the ability to identify factors responsible for rapid or lagged revenue growth"(*Ibid*, p.76).

In the partitioning approach, as discussed earlier, tax elasticity and buoyancy coefficients are partitioned into tax to base and base to income components. Generally, the product of tax to base elasticity coefficient and the base to income elasticity coefficient is equal to the overall elasticity coefficient drawn from the traditional approach. However, this may not happen always. This study attempts to verify whether or not the results obtained from both the approaches are similar.

This study differs from a number of previous studies as it has included all the major tax components, including excise duties. The author feels that it is not appropriate to exclude excise duty, the tax component with the share of over 13 percent on total tax revenue.

Hence, the principal objectives of the study are: a) to introduce the concept of elasticity and buoyancy of tax, b) to estimate the elasticity and buoyancy of tax in Nepal for the period 1975-2005, c) to seek the difference between the buoyancy and the elasticity of tax in Nepal, d) to investigate whether the results obtained through traditional approach and the partitioning approach are similar or different, and e) to ensure whether or not the tax system in Nepal is elastic.

III. Data Sources, Limitations, Adjustment Procedures and Elasticity and Buoyancy Calculation

The data on GDP, tax revenues and their proxy bases are taken from the *Budget Speeches* and various issues of *Economic Survey* published by the Government of Nepal as well as the various issues of *Quarterly Economic Bulletin* of Nepal Rastra Bank. The study follows the IMF's *Government Finance Statistics (GFS)* method to classify the tax revenue. "In this classification, tax revenues are classified with respect to their bases on which they are levied"(*Ibid*, p.80). The tax revenue can be classified on the basis of income, profit, consumption of goods and services, international trade, property etc. For example, income tax is levied on income of individuals and profits of business. In this study, for simplicity purpose, the non-agricultural income is taken as the proxy base for the income tax (as the agricultural income is not taxed in Nepal). The VAT and excise are levied on private consumption and import duties are levied on the imports of goods and services. The total tax is based on the GDP at current market price.

Table 1: Proxy Tax Bases

Tax Revenue	*Proxy Bases*
Income Tax	Nonagricultural income at time t-1
VAT and Excise Tax	Private consumption at time t
Import Tax	Imports of goods and services at time t
Total Tax	Nominal GDP at time t

Limitations

There are three limitations of the study. In the first, due to the unavailability of the actual data of tax revenue from discretionary changes, the budget estimates of such revenue through discretionary change are cleaned by applying the proportional adjustment method. Secondly, since VAT was launched in November 1997 in Nepal, no time series data prior to that time are available. For that reason, the aggregate data on sales tax, hotel tax, entertainment tax and contract tax are used in place of VAT prior to 1997. Finally, because of the difficulty to access data prior to 1975, only data for the period of 30 years are used for the elasticity and buoyancy estimation purpose.

The Adjustment Procedure

Tax revenue usually changes due to discretionary measures, for example, changes in tax rates, tax net expansion and so on. Therefore, a need to separate the changes in revenue emanating through the discretionary measures from that due to automatic measures arises to estimate the elasticity. This is the way to distinguish tax elasticity from tax buoyancy.

Tax revenue series can be adjusted in three ways: constant rate procedure, the proportional adjustment procedure and the dummy variable procedure. The selection of the appropriate adjustment method depends upon the availability of the data on tax changes and the type and frequency of such changes (*Ibid*, p.78). The constant rate structure method requires disaggregated data on tax rates and tax bases, which is not easily available in Nepal. Since the tax revenues change frequently through the discretionary changes, the dummy variable procedure is not applicable. So the proportional adjustment procedure, which requires calculation of the revenue implications of discretionary measures, is applied in the study to adjust the historical tax revenue data. In this method, to remove the estimated revenue impact through discretionary measures, the annual observed data are adjusted for discretionary changes. The resulting series are converted to the first year's basis by adjusting the year to year changes by the ratio of the tax yield on the basis of the first year rates to the actual tax yield.

The proportional adjustment method (Sahota, 1961) is as follows:

$$NR_t = \frac{AR_t - DR_t}{AR_{t_1}} \times NR_{t1}$$

where NRt = net or adjusted revenue series in year t; $AR_{t=}$ actual revenue collection in year t; $DR_{t=}$ proportional revenue collection through discretionary changes in year t; and $AR_{t-1=}$ net revenue series in preceding year.

Elasticity and Buoyancy Calculation

Elasticity is defined as the ratio of proportionate change in adjusted tax to the relative change in income in such a way as,

$$\text{Elasticity} = \frac{\Delta T^* / T^*}{\Delta \text{Base} / \text{Base}}$$

where ΔT^*= change in tax revenues adjusted for the estimated impact of changes in the tax system over the period.

$$\text{Buoyancy} = \frac{\Delta T / T}{\Delta \text{Base} / \text{Base}}$$

where ΔT = change in actual tax revenues over the period.
"If the changes in the tax system are revenue enhancing, then buoyancy will exceed elasticity" (IMF, 2006).

IV. METHODOLOGY

The study has applied time series regression approach for the empirical measurement of the elasticity as well as buoyancy for the different types of taxes stated earlier. Generally tax elasticity/buoyancy is calculated using the regression equation:

$$\log tr_t = a + b \log gdp_t + u_t \quad (1)$$

where tr_t = tax revenue at time t (adjusted in case of elasticity and actual in case of buoyancy); a=intercept; b=elasticity or buoyancy coefficient of respective tax; gdp_t = nominal GDP at time t; and u_t = error term .

As stated earlier, the partitioning approach has been applied to estimate the elasticity and buoyancy coefficients. That means, tax elasticity and buoyancy are estimated through two ways: tax to base and base to income. Tax to base elasticity measures the progressiveness of the tax structure, and/or a given trend in administrative efficiency, while the base to income elasticity measures the responsiveness of tax base to income. The product of these two coefficients gives the same result of traditional income elasticity approach (Mukul, 1977).

The functional form of the least square equation for computing tax to base elasticity is in log linear or double log specification such as :

$$\log tr_t = a + b \log tb_t + u_t \quad (2)$$

where tr_t = tax revenue at time t (adjusted in case of elasticity and actual in case of buoyancy); a= intercept; b=elasticity or buoyancy coefficient of respective tax; tb_t = tax base at time t; and u_t = error term

The regression used to estimate base to income elasticity/buoyancy is:

$$\log tb_t = a + b \log gdp_t + u_t \quad (3)$$

where tb_t = tax base at time t and gdp_t = GDP at market prices at time t

Unit Root Tests

The second step in seeking a methodology for modeling any economic relationship is to ascertain the stationarity of the variables under scrutiny, otherwise regression results would be spurious (nonsense). Table 2 shows the Augmented Dickey Fuller (ADF) test for all variables under the study. ADF has been calculated at first lag with intercept.

TABLE 2: ADF Test Results (Unit Root Tests)

Variables	*Level*	*First Difference*
$lngdp_t$	-0.833	-6.255
$lnexd_t$	-0.754	-6.4-645
$lnimd_t$	-2.078	-4.771
$lninct_t$	-0.013	-5.338
$lnnagdp_{t-1}$	-1.488	-2.692 (10%)
$lnpvtcon_t$	-0.947	-6.512
$lntimp_t$	-1.418	-4.570
$lntr_t$	-1.213	-5.006
$lnttr_t$	-1.227	-5.241
$lnvat_t$	-0.023	-4.175
$lnaexd_t$	-0.532	-5.792
$lnaimd_t$	-1.574	-6.263
$lnainct_t$	-1.449	-4.369
$lnatr_t$	-0.870	-5.729
$lnattr_t$	-0.920	-5.397
$lnavat_t$	-1.419	-4.855

Mackinnon critical values for rejection of null hypothesis of a unit root are : 1 % critical value = -3.689
5% critical value = -2.972
10% critical value = -2.625

The figures shown are 't' ratios for which a suggested significance value in the ADF test is -3.0 or below (Dickey and Fuller, 1979, 1981).

ADF statistics in the above table shows that all variables under scrutiny have unit roots. In other words, they are non-stationary in level but stationary in the first difference. In this case, the regression is run on the first difference. But the regression (first difference) provides the results in growth but not the elasticity estimates . Since the main purpose of this study is to examine the elasticity and buoyancy of tax, the primary tool for this would be to run the regression in the natural log linear form. Moreover, as the regressions on levels have very high-adjusted R^2 it is a positive indication to apply the regression on log levels (Special Study Division, 2004). The presence of auto correlation, observed in all estimated equations have been corrected by applying the Cochrane – Orcutt method [AR(1)] and / or moving average method [MA(1)] .

5. Analysis of Results

Import Duties

The elasticity of import tax is 0.54 (Appendix 2) implying that a 10 percent change in the nominal GDP results in a 5.4 percent change in import tax. The result is significant at 1 percent level with a satisfactory adjusted R^2 (0.93). DW statistics is 1.98 reflecting a very little auto correlation in the equation. The buoyancy coefficient, on the other hand is 1.05 (Appendix 1). It is higher by 0.51 (1.05-0.54) compared to the elasticity coefficient implying that a 5.1 percent change in import tax through discretionary measures was due to a 10 percent change in the nominal GDP. From this, it can be easily observed that import tax in Nepal is inelastic. In the period 1975-1994, the elasticity and buoyancy of import tax were 0.51 and 1.05 respectively (Adhikari, 1995). Clearly in that period, the role of discretionary measures to generate import tax was even higher than the review period. However, this was not so significant.

Also in the case of ' tax to base ' coefficients, buoyancy (0.83) as shown in Appendix 1 was higher by 0.40 over the elasticity (0.43) as illustrated in Appendix 2. It implies that although the 10 percent changes in the total value of imports results in an 8.3 percent change in the import tax, the 4.3 percent change is from discretionary measures. Also in this case, elasticity is about approximately half of the buoyancy. In the period 1975-1994 such tax to base (import duties to total imports) elasticity and buoyancy were 0.40 and 0.80 respectively (Adhikari, 1995). Thus, no additional changes have taken place in this period in the structure of elasticity and buoyancy.

One interesting finding of this study is that import tax is not much responsive to the changes in the value of imports. This conclusion is confirmed by the fact that despite a substantial increase in imports in the early and mid-1990s, the import duties did not increase in this proportion (Special Study Division, 2004). The decrease in tariff rates, composition of the imports (for example, majority of raw materials and capital goods which attract low duties), large informal trade between Nepal and India, removal of quantitative restrictions, as well as inefficiency of the customs administration to control revenue leakage are the main reasons for such a low responsiveness of import duties to the value of imports.

Another important finding is that both the traditional approach (tax to GDP) and the partitioning approach (tax to base and base to income) for calculating the elasticity provide very similar results. In the case of import tax, the traditional approach provides buoyancy (import duties to GDP) as 1.05. The product of the tax to base (import duties to total imports) and the base to income (total imports to GDP) under the partitioning approach is 1.03. Similarly, the traditional approach provides elasticity coefficient of import duties at 0.54. In the partitioning approach, such elasticity coefficient is 0.52. Therefore, the verification of the equation is also possible under the study.

Income Tax

The buoyancy of income tax is 1.37 and the elasticity coefficient is 0.41. The results are significant at 1 percent level with an adjusted R^2 (0.98) for buoyancy and 0.92 for elasticity . This clearly shows that there is very low natural growth of income tax during

the review period. The major portion of income tax is received through discretionary measures. During the period 1975-94, buoyancy and elasticity of income tax were 1.14 and 0.39 respectively (Adhikari, 1995). In the review period, the buoyancy coefficient of income tax has improved because several types of income are brought into the tax net . Many private limited companies, foreign airlines, joint venture banks and financial institutions were established and their income are brought into the tax net. Interest and dividend tax were introduced during this period. It can be observed that most of the sources of income, which were exempted earlier, are brought into the tax net today. Moreover, the income tax rates are frequently changed through the annual budget. These developments in tax structure may lead to the improvement in income tax buoyancy in the review period. However, the elasticity coefficient improved very slowly. The nominal increase (0.02) in the elasticity coefficient implies that there is very low scope of natural growth of income tax and that the discretionary measures have the vibrant role in generating income tax revenue.

The results obtained under both the traditional and partitioning approach are fairly close. For example, elasticity under the traditional approach is 0.41, which is fairly close to 0.43 under the partitioning approach.

Value Added Tax

Prior to 1997, the VAT was not existent. However sales tax, contract tax, and hotel tax were present. Therefore, the sum of these taxes is treated as VAT up to that time. The elasticity and buoyancy of VAT are calculated in two periods 1975-1996 and 1975-2005, as the sample period of VAT is very small, that is, eight years only.

From the empirical results, the elasticity and buoyancy coefficients of VAT are 0.55 and 1.15 respectively during the review period. In the period 1975-1996 (prior to the introduction of the VAT), such coefficients (the sum of sales tax, contract tax ,hotel tax and entertainment tax) were 0.82 and 1.04 respectively. This result demonstrates that after the introduction of the VAT, tax buoyancy increased but the tax elasticity declined. Though the VAT is introduced in Nepal with an expectation of broadening the tax base, eliminating tax cascading, creating an investment friendly tax system and increasing the revenue, it seems also inelastic. The results obtained under the traditional approach and the partitioning approach are fairly close in this case, too.

Excise Tax

This is only the tax, whose buoyancy is less than unity (0.98). Its elasticity coefficient is 0.49, which is exactly half of the buoyancy. It means that 10 percent change in nominal GDP results in a 9.8 percent change in excise tax, of which 4.9-percentage points falls in the discretionary measures. It clearly illustrates that there is low natural growth of excise tax during the review period. The elasticity results are significant at 1 percent level with an adjusted R^2 (0.96) and DW statistics (1.95) reflecting very low positive serial correlation. Also the buoyancy results are significant at 1 percent level with quite high-adjusted R^2 (0.99) and DW statistics (2.00) showing the optimum level of autocorrelation. The proxy base of excise under the partitioning approach is private sector consumption. The results obtained under both the traditional and the partitioning approaches are similar

in case of elasticity as well as buoyancy. The results confirm that excise duties in the review period are not much responsive to the GDP. Usually the adoption of specific excise duties rather than advalorem tax rate, exemption and the leakage may be the principal resources.

Total Tax and Total Revenue

Total tax revenue which occupies approximately 80 percent of the total revenue mobilization in Nepal has been assigned elasticity coefficient (0.51) which is less than half of the buoyancy (1.12). From these results, it can be easily observed that there is very low automatic growth of the tax revenue reflecting a very inelastic tax structure.

During the review period, total revenue has been assigned the elasticity coefficient of 0.59 (Appendix 2) implying that total revenue changes by 5.9 percent as a result of 10 percent change in the nominal GDP (removing the revenue from discretionary changes). On the other hand, buoyancy of the total revenue is more than unity (1.14) (Appendix 1). The difference between the elasticity and buoyancy of the total revenue is 0.55 which indicates that 10 percent change in nominal GDP results in 5.5 percent change in total revenue through discretionary changes. It denotes that even after many tax reforms in this period, revenue mobilization heavily depends upon the discretionary measures. During the period 1975-94 such revenue elasticity coefficient was 0.65 and buoyancy was 1.10 (Adhikari, 1995) . The difference was 0.45. It clearly shows that in the review period, the automatic response of the revenue to the nominal GDP was further discouraged implying that even in the later period revenue mobilization through discretionary changes has increased.

VI. CONCLUSION AND RECOMMENDATIONS

A time series analysis of tax elasticity and buoyancy reveals an inelastic tax structure in Nepal for the period 1975-2005. Taxes are not responsive to changes in income with most elasticity coefficients reporting below unity. The tax system is not progressive adequately also in the case of proxy bases. A progressive tax system needs to have at least greater than unitary value of the coefficient of elasticity, (Adhikari, 1995). And a higher degree of progressivity in the tax structure would result in an elasticity greater than 2 (Dahal, 1984). The low built in flexibility (elasticity) observed in Nepalese tax system is explained through a variety of factors such as exemptions, tax incentives, duty waivers, low compliance and the large sectors of the economy which are not subject to taxation. Therefore, the automatic response of tax to income is low. Compared to the period 1975-1994, the elasticity coefficients of tax during the review period did not reveal significant differences. However, the higher coefficients obtained through the sensitivity (buoyancy) analysis focus on the role of discretionary measures in maintaining a steady source of tax revenue throughout the review period.

The targeted average revenue growth mentioned in the Tenth Plan could be achieved only with the rigorous efforts of the fiscal authorities to improve the overall tax system as well as revenue administration. The major recommendations in this regard are as follows:

(a) As the study reveals that the import tax is not much responsive to the changes in the value of imports, the need for enhancing the efficiency of the customs administration

to control the revenue leakage is highly felt. Improvement in customs valuation, discouraging the over-invoicing and under-invoicing, penalizing the wrong declaration of imported goods and misutilization of pass book facility at customs points, checking the use of duplicate documents, minimizing LC related frauds, enhancing the ASYCUDA (Automated System for Customs' Data), and enhancing the activities of customs patrolling group are some of the major mechanisms of enhancing the customs reforms.
With regard to the VAT, developing a sound billing habit, increasing consumers' consciousness on demanding bills, easing the tax deduction and VAT refund process, discouraging the sellers' trend of demanding huge amount of 'tax credit', developing cooperative and positive thinking of VAT personnel to correct the mistakes of the sellers on maintaining the accounts, relevant training for the VAT personnel, right placement of the personnel as well as less frequent transfer policy are some of the important measures that need to be taken.

(b) With respect to excise duties, introducing new goods in the tax net, and thus broadening the tax net of excise duties, adoption of advalorem tax rates rather than specific tax rates are the major steps to be taken.

(c) In the context of income tax, agricultural income, which has been left outside the tax net due to non-economic issues, should be brought under the tax net. As agriculture contributes about 38 percent to the GDP, there is no reason to keep this sector outside the tax net. Additionally, deduction of unnecessary exemptions, introduction of income tax on new services which were not taxed earlier are the ways to generate more revenue from income tax.

(d) On the total tax revenue front, establishment of simple, equitable, fair and practical tax system with lower and less differentiated taxes and tariff rates, widened bases and enhanced voluntary tax compliance are very crucial to improve tax administration. Moreover, rationalizing the tax structure and rates, reducing discretionary exemptions and burdensome bureaucratic requirements are recommended to enhance the efficiency of the tax administration.

Only the discretionary measures cannot generate more revenue forever. Automatic measures for generating tax revenue is of the great essence in this regard. Improvement in tax administration to control the leakage and to broaden the tax bases in practice is important for enhancing the elasticity of the tax.

APPENDIX 1: Buoyancy of Major Taxes in Nepal – Sample Period (1975-2005)

Major Taxes	Equation Applied	a	b	Adj R^2	DW	P	AIC	SC	F- Statistics
1. Excise Duties									
Total Buoyancy	$lnexd_t$ c $lngdp_t$ MA(1) AR(1)	-4.50	0.98	0.99	2.00	0.44	-1.68	-1.49	1246.51
		(-8.69)	(22.60)						
Tax to Base	$lnexd_t$ c $lnpvtcon_t$ AR(1)	-4.29	0.99	0.99	1.66	0.71	-1.91	-1.77	2291.85
		(-6.54)	(17.97)						
Base to Income	$lnpvtcon_t$ c $lngdp_t$ AR(1)	-0.12	0.99	0.99	2.00	0.05	-3.55	-3.41	11384.37
		(-1.46)	(142.99)						
2. Import Duties									
Total Buoyancy	$lnimd_t$ c $lngdp_t$ AR(1) MA(1)	-4.36	1.05	0.99	2.07	0.52	-1.77	-1.58	1554.93
		(-7.60)	(21.75)						
Tax to Base	$lnimd_t$ c $lntimp_t$ AR(1) MA(1)	-0.56	0.83	0.99	2.01	0.47	-1.34	-1.14	1007.57
		(-1.45)	(22.43)						
Base to Income	$lntimp_t$ c $lngdp_t$ AR(1) MA(1)	-4.08	1.22	0.99	2.00	0.69	-1.70	-1.51	1979.76
		(-5.65)	(20.33)						
3. Income Tax									
Total Buoyancy	$lninct_t$ c $lngdp_t$ AR(1)	-8.91	1.37	0.98	1.28	0.66	-0.33	-0.19	895.00
		(-7.55)	(13.79)						
Tax to Base	$lninct_t$ c $lnnagdp_{t-1}$ AR(1) MA(1)	-6.70	1.25	0.99	1.81	0.61	-1.12	-0.94	1369.83
		(-6.32)	(13.28)						
Base to Income	$lnnagdp_{t-1}$ c $lngdp_t$ AR(1) MA(1)	-2.26	1.14	0.99	1.97	-0.04	-2.98	-2.79	5792.72
		(-20.80)	(122.19)						
4. VAT									
Total Buoyancy	$lnvat_t$ c $lngdp_t$ AR(1) MA(1)	-5.54	1.15	0.99	1.83	0.49	-1.93	-.174	2187.47
		(-9.95)	(24.73)						
Tax to Base	$lnvat_t$ c $lnpvtcon_t$ AR(1) MA(1)	-5.31	1.16	0.99	1.67	0.54	-1.83	-1.63	1974.04
		(-9.65)	(24.7)						
Base to Income	$lnpvtcon_t$ c $lngdp_t$ MA(1)	-0.12	0.99	0.99	2.00	0.05	-3.55	-3.41	11384.37
		(-1.46)	(142.99)						
5. Total Tax	$lnttr_t$ c $lngdp_t$ MA(1)	-3.94	1.12	0.99	1.91	0.17	-2.73	-2.54	7793.21
		(-14.87)	(49.54)						
6. Total Revenue	$lntr_t$ c $lngdp_t$ AR(1) MA(1)	-4.00	1.14	0.99	1.89	-0.10	-2.60	-2.41	4044.46
		(-20.49)	(68.50)						

(Figures in parentheses are t – statistics)

a = estimated intercept

b = estimated buoyancy coefficient

p= autocorrelation coefficient

All buoyancy coefficients are significant at 1 percent .

AIC=Akaike Info Criterion

SC= Schwarz Criterion

$lnexd_t$ = natural log of excise duties at time t

$lngdp_t$ = natural log of nominal GDP at time t

$lnpvtcon_t$ = natural log of private consumption at time t

$lnnagdp_{t-1}$ = natural log of non agricultural GDP at time t-1

$lnvat_t$ = natural log of Value Added Tax at time t

$lntr_t$ = natural log of total revenue at time t

$lninct_t$ = natural log of income tax at time t

$lnimd_t$ = natural log of import duties at time t

$lntimp_t$ = natural log of total value of import at time t

APPENDIX 2 : Elasticity of Major Taxes in Nepal – Sample Period (1975-2005)

Major Taxes	Equation Applied	a	b	Adj R^2	DW	P	AIC	SC	F- Statistics
1. Excise Duties									
Total Elasticity	$lnaexd_t$ c $lngdp_t$ AR(1)	-0.08	0.49	0.96	1.95	0.50	-1.68	-1.74	450.78
		(-0.19)	**(14.8)**						
Tax to Base	$lnaexd_t$ c $lnpvtcon_t$ AR(1)	-0.01	0.49	0.96	2.08	0.44	-1.71	-1.57	435.8
		(-0.03)	(16.38)						
Base to Income	$lnpvtcon_t$ c $lngdp_t$ AR(1)	-0.12	0.99	0.99	2.00	0.05	-3.55	-3.41	11384.37
		(-1.46)	(142.99)						
2. Import Duties									
Total Elasticity	$lnaimd_t$ c $lngdp_t$ AR(1)	0.45	0.54	0.93	1.98	0.46	-0.62	-0.48	196.59
		(0.71)	(9.97)						
Tax to Base	$lnaimd_t$ c $lntimp_t$ AR(1)	2.36	0.43	0.93	2.03	0.39	-0.61	-0.47	194.73
		(6.07)	(11.45)						
Base to Income	$lntimp_t$ c $lngdp_t$ AR(1) MA(1)	-4.08	1.22	0.99	2.00	0.69	-1.70	-1.51	1979.76
		(-5.65)	(20.33						
3. Income Tax									
Total Elasticity	$lnainct_t$ c $lngdp_t$ AR(1) MA(1)	0.45	0.41	0.92	2.03	0.52	-0.68	-0.49	107.37
		(0.40)	(4.37)						
Tax to Base	$lnainct_t$ c $lnnagdp_{t-1}$ AR(1) MA(1)	1.03	0.38	0.92	2.04	0.55	-0.73	-0.54	113.75
		(1.06)	(4.35)						
Base to Income	$lnnagdp_{t-1}$ c lngdpt AR(1) MA(1)	-2.26	1.14	0.99	1.97	-0.04	-0.54	-2.79	5792.72
		(-20.80	(122.19)						
4. VAT									
Total Elasticity	$lnavat_t$ c $lngdp_t$ AR(1)	0.35	0.55	0.96	1.85	0.79	-0.83	-0.69	344.73
		(0.19)	(3.76)						
Tax to Base	$lnavat_t$ c $lnpvtcon_t$ AR(1)	0.20	0.58	0.96	1.81	0.79	-0.85	-0.71	352.42
		(0.12)	(4.11)						
Base to Income	$lnpvtcon_t$ c $lngdp_t$ MA(1)	-0.12	0.99	0.99	2.00	0.05	-3.55	-3.41	11384.37
		(-1.46)	(142.99)						
5. Total Tax	$lnattr_t$ c $lngdp_t$ AR(1)	1.88	0.51	0.96	1.91	0.62	-1.50	-1.37	416.97
		(3.22)	(10.32)						
6. Total Revenue	$lnatr_t$ c $_{lngdpt}$ AR(1)	1.30	0.59	0.97	1.94	0.50	-1.59	-1.45	586.01
		(3.12)	(16.66)						

(Figures in parentheses are t – statistics)

a = estimated intercept

b = estimated elasticity coefficient

p= autocorrelation coefficient

All elasticity coefficients are significant at 1 percent .

AIC=Akaike Info Criterion
SC= Schwarz Criterion

$lnaexd_t$ = natural log of adjusted excise duties at time t

$lngdp_t$ = natural log of nominal GDP at time t

$lnpvtcon_t$ = natural log of private consumption at time t

$lnnagdp_{t-1}$ = natural log of non agricultural GDP at time t-1

$lnavat_t$ = natural log of adjusted Value Added Tax at time t

$lnattr_t$ = natural log of adjusted total tax revenue at time t

$lnatr_t$ = natural log of adjusted total revenue at time t

$lnainct_t$ = natural log of adjusted income tax at time t

$lnaimd_t$ = natural log of adjusted import duties at time t

$lntimp_t$ = natural log of total value of import at time t

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Financial Liberalization and Financial Development in Nepal

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An efficient financial system can effectively mobilize and allocate resources leading to robust economic growth. Financial liberalization improves the functioning of financial system by increasing the availability of funds and allowing risk diversification and increased investment. The indices of financial liberalization and financial development, generated by the principal component analysis, depict a gradual process of financial liberalization and a continuous financial sector development. The paper finds the presence of bi-directional causal relationship between the liberalization of financial sector and level of financial development in Nepal.

I. INTRODUCTION

A deep and efficient financial system can contribute robustly to sustained economic growth and lower poverty (Beck, Levine, and Loayza 2000). An efficient and effective provision of financial services requires that financial policies and financial system structures be adjusted in response to financial innovations and shifts in the broader macroeconomic and institutional environment. Thus, the financial system acts as the brain of modern economy. Well developed financial systems ease the exchange of goods and services by providing payment services; help mobilize and pool savings from a large number of investors; acquire and process information about enterprises and possible investment projects, thus allocating society's savings to their most productive use; monitor investments and exert corporate governance; and help diversify and reduce liquidity and intertemporal risk (Levine, 1997, 2004). The proponents of liberalization argue that the allocation of capital is more efficient in a competitive financial system and that higher real interest rates stimulate saving, thereby raising the funds available to finance investment (McKinnon 1973, Shaw 1973). In McKinnon's (1973) Complementary Hypothesis, money and capital are complementary to each other. High interest rate can mobilize more savings. According to Shaw's (1973) Debt Intermediation View (DIV), high real interest rates are essential in order to attract more savings. Thus, the McKinnon – Shaw framework of financial liberalization asserts that high interest rates

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can avail more financing by sufficiently mobilizing scarce savings. Financial interventionism in the 1960s and 1970s directed cheap credit to favoured sectors (industry, exports, small enterprises, and agriculture), which deemed productive, but discouraged consumption and trade as unproductive. In doing so, credit ceilings and high reserve requirements were imposed and interest rate administered in order to contain inflationary pressure due to cheap credit policy. However, financial interventionism could benefit neither industry and exports nor the agricultural sector. Such credits at low rates tended to be characterized by poor lending decisions, weak repayment discipline, and corruption in the government, since those granted access to capital (usually at low rates) may buy influence to protect their favored positions. Rather, it distorted financial development and economic growth (Fry 1995, 1997).

However, financial crisis is more prone to financial liberalization. Financial fragility aggravates unpleasant economic development, inappropriate economic policies and balance of payment problems. Institutional development with effective legal enforcement, prudential regulation in place, efficient bureaucracy and low level of corruption minimize the reverse impacts of financial liberalization (Demirguc-Kunt and Detragiache, 1999). Legal environment (including enactment and enforcement of laws) has important influence on financial liberalization and financial development of a country. Reforms including advancing investor protection are likely to promote financial development (La Porta *et al*, 1998, 2002). Imperfect financial markets make external finance costly and reduce investment. Financial development (Rajan and Zingales, 2003; and Love, 2003) and banking sector liberalization (Laeven, 1999) help to reduce financing constraint and raise investment.

Financial liberalization helps to improve the functioning of financial system by increasing the availability of funds and allowing risk diversification and increased investment (Bekaert et al. 2000). Moreover, financial liberalization helps to discipline policymakers enticed to a captive financial market. Financial liberalization triggers financial development, which facilitates economic growth (King and Levine, 1993; Jayaratne and Strahan, 1996; Rajan and Zingales, 1998).

The process of reforms or liberalization varies across countries and is dependent upon the prevailing politico-economic features. In some of the developing countries (the Latin American countries, in particular) financial sector reforms started with interest rate liberalization, whereas in Nepal the easing of entry barriers was followed by the liberalization of interest rates on deposits and loans so as to foster competition. The statutory liquidity requirement (SLR) was lifted in 1989 as part of financial reforms, but re-imposed in 1991 for two more years. Deregulation of interest rates and credit control began in 1986 and full deregulation took place only in 1989. Regarding international financial transactions, current account convertibility was undertaken in 1993, whereas move towards capital account convertibility has been cautious. The chronology of financial reforms and financial liberalization index as illustrated in Appendix 1 and 2 respectively depict the financial reform process in Nepal.

The next section discusses the theoretical framework on deriving the indices of financial liberalization and financial development. The objectives of the study and methodology adopted are discussed in the third section. In the fourth section, the indices of financial liberalization and financial development are developed, followed by the interpretation in the fifth section. The sixth section analyzes the causal relationship

between financial liberalization and financial development. The last section concludes the study.

II. THEORETICAL FRAMEWORK

The index of financial liberalization documents the trend and pace of financial reforms. Most of the researchers have constructed their own indices of financial liberalization based upon the chronological study of different financial systems. Demirguc-Kunt and Detragiache (1999) have considered the deregulation of interest rates as the liberalization of domestic financial sector and include liberalization of domestic banking sector and opening up the stock markets to foreign investors. In a survey of financial liberalization in 34 countries, Williamson and Mahar (1998) have identified six different dimensions of financial liberalization: (1) elimination of credit controls, (2) deregulation of interest rates, (3) lifting of entry barriers into the banking industry, (4) bank autonomy, (5) pace of privatization of public sector banks, and (6) liberalization of international capital transactions.

Kaminsky and Schmukler's (2002) index of financial liberalization captures a wide degree of intensity of financial liberalization, including the episodes of reversal and the regulation on domestic financial institutions and non-financial corporations, multiple exchange rates, and controls over capital flows. They have divided financial system into three regimes (as fully liberalized, partially liberalized and repressed and ranked by 1, 2 and 3 respectively). The lower the index, the more liberalized is the financial system.

Demetriades and Luintel (1996 a, b) have directly measured the degree of control in the banking sector of Nepal and India separately by applying the principal component method and taking interest rate controls, liquidity requirements, directed lending, and branch banking as the proxy of financial repression. They have mentioned ceilings, floor and band on both lending and deposit rates. Bekaert *et al* (2000) have considered capital account convertibility as the measure of financial liberalization. The indicator takes a value between zero (pre-reform period) and one (post-reform period). Bandiera, Caprio, Honohan and Schiantarelli's (1998, 1999) studies find eight different components: interest rates, pro-competition measures, reserve requirements, directed credit, bank ownership, prudential regulation, securities markets deregulation, and capital account liberalization. They generate the index by using principal component method.

Abiad and Mody (2003) have indexed financial liberalization for 35 countries including Nepal, over a period 1973 to 1996. They pursue political economy perspective in explaining timing, pace and extent of financial sector reforms. They have considered six policy dimensions as the inputs while indexing the degree of policy liberalization. They are: (i) credit controls, (ii) interest rate controls, (iii) entry barriers, (iv) regulations and securities markets, (v) privatization in the financial sector, and (vi) restrictions on international financial transactions.

Ang and McKiibbin (2005) developed a single index of financial development by using principal component method. The indicators of financial development are logarithm of (i) ratio of liquid liabilities to GDP, (ii) ratio of commercial bank assets to total assets of commercial bank and central bank and (iii) ratio of domestic credit to private sector to GDP.

III. OBJECTIVES AND METHODOLOGY

This paper aims to provide a better understanding of the liberalization process in Nepal over the period 1975 to 2006. It captures various aspects of liberalization. It covers several regulatory reforms and impositions of prudential regulation and other control measures to provide information on the degree of financial liberalization while relating it to institutional reforms. The principal component analysis is performed to reduce a large number of correlated variables into the two indices of financial liberalization and financial development so as to overcome the problem of muticollinearity.

The paper examines casual relationship between financial reforms and financial development. Granger causality test is performed to find out the direction of causation between the financial liberalization and financial development. Granger causality test (Granger 1969, and Sims 1972) is used to test whether changes in one variable causes change in another or both of them are endogenously determined. Given the two variables financial development (X) and financial liberalization (Y), we estimate unrestricted and restricted equations, as given below.

Unrestricted Regression: $$Y_t = \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=1}^{q} \beta_j X_{t-j} + u_t \quad (1)$$

Restricted Regression: $$Y_t = \sum_{i=1}^{p} \alpha_i Y_{t-i} + u_t \quad (2)$$

where, u_t is white noise, p is the order of the lag for Y, and q is the order of the lag for X.

IV. INDICES OF FINANCIAL LIBERALIZATION AND FINANCIAL DEVELOPMENT

Different dimensions of financial liberalization and financial development are highly correlated. It is obvious that correlation does not imply causation, but it is likely to be an outcome of causality. The principal component analysis reduces a number of correlated variables into a smaller set of uncorrelated principal components. It sufficiently deals with the problems of multicollinearity. It expresses different dimensions of financial liberalization and financial development in terms of two indices of financial liberalization and financial development respectively. The new proxies of financial liberalization and financial development are able to capture most of the information from the original series.

The method of principal components involves linear transformation of a large number of policy variables, which are possibly correlated. In this method, a new series is developed with standardized variables so that they are uncorrelated and they are ordered in terms of variance. The standardized series is constructed by deducting the mean of the variables and dividing it by the respective standard deviation. The variances of each policy variable are divided by the square root of the sum of the variance to get the loadings for each policy variable. Finally, the standardized series are multiplied by respective loading. While generating the index of financial liberalization each dimension is classified into four categories, fully repressed, partially repressed, largely liberalized and fully liberalized and graded as 0, 1, 2 and 3 respectively.

The index of financial development consists of the ratios of liquid liabilities of the financial system to GDP, credit to private sector to GDP, domestic assets of commercial banks to the sum of domestic assets of Nepal Rastra Bank and commercial banks, and private sector credit to total loans and advances of commercial banks. The subject matter of financial liberalization is broader and it requires subjective judgment while constructing the index of financial liberalization. The grading is also subjective. However, some guiding principles have been adopted to reduce subjectivity. Interest rates control, for example, was graded as fully repressed when it was determined by the central bank and partially repressed when the interest rates were subject to a ceiling or floor or allowed to vary within a band. It was largely liberalized when some of the interest rates were allowed to be completely market driven and finally fully liberalized when all the restrictions were removed completely. Each subcomponent is ranked between 0 and 3 and their sum is divided by total number of subcomponents to reach into the common ranking of every dimensions. Since each of the indices can take on values between 0 and 3, the sum takes on values between 0 and 18 altogether.

The indices of financial liberalization and financial development are for the period 1975 – 2006. Financial liberalization index is derived from six different dimensions of financial policy variables as suggested by Abiad and Mody (2003). The ratios of broadly defined money supply to nominal GDP, private sector credit to GDP, private sector credit to total loans and advances of commercial banks and total assets of commercial banks to total assets of commercial banks and domestic assets of central bank are used to construct the index of financial development (as used by King and Levine 1993a; Beck *et al* 2004; Levine 2004). Data for nominal GDP is obtained from various issues of the *Economic Survey* published by the Government of Nepal, broad money supply is used as proxy for liquid liabilities, credit to the private sector and total assets of commercial banks, domestic assets of Nepal Rastra Bank and total loans and advances of commercial banks are taken from various issues of *Quarterly Economic Bulletin* published by the Nepal Rastra Bank.

Index of Financial Liberalization

The index of financial liberalization captures the various policies implemented for liberalizing the financial sector. This paper, therefore, considers six dimensions of financial sector policies to arrive at a single index of financial liberalization.

(a) *Entry Barriers (ENTRANCE):* It covers licensing requirements, limits on foreign participation in the banking sector, restrictions on bank specialization and establishment of universal banking.

(i) Licensing requirements: Licensing was totally restricted before 1984 and ranked by 0. Restrictions were eased as documented by 1 up to 1997, which increased to 1.50 for 2000 to 2002 and further to 1.75 in 2003.

(ii) Limits on foreign bank participation: Domestic private sector was allowed for new entrance since 1998 and it is marked as 2 onwards.

(iii) Restrictions to bank specialization: Bank specialization was allowed after 1984 (graded as 1) with widening of private participation since 1998 (graded by 2). Bank specialization is graded 0 before 1984.

(iv) Universal banking is not allowed yet and ranked as 0.

(b) *Interest Rate Controls (INTEREST):* It is a policy variable that seeks to find out whether there exists a direct control over interest rates (in the form of floor, ceilings or interest rate bands). Complete administrative control over the interest rates before 1984 is indicated by 0. Liberal attitude towards fixing interest rates within the range of 1 to 1.5 percent since 1984 to 1985 is ranked as 1. Similarly, partial deregulation between 1986 and 1989 is ranked by 2 and thereafter by 3 as complete deregulation.

(c) *Credit Controls (CREDIT):* This policy variable comprises of directed credit, credit ceilings and reserve requirements (both CRR and SLR).

(i) Directed credit to the favored industries or sectors: Directed credit existed until 2001 and is graded as 0. As it was eased in 2002, it is ranked by 2; it is graded as 3 as it was phased out gradually starting from 2003.

(ii) Credit ceilings toward other sectors: Credit ceilings were present till 1989 and then removed. Therefore, it is graded as 0 before 1989 and 3 onwards.

(iii) High reserve requirements: It is the summation of cash reserve requirement (CRR) and statutory reserve requirement (SLR). The reserve requirement below 10 percent of deposit liabilities is noted as fully liberalized, 10-15 as largely liberalized, 15-25 as partially repressed and above 25 percent as completely repressed. It is ranked by 3, 2, 1 and 0 respectively.

(d) *Regulations and Securities Market (REGULATION):* This variable includes the presence and magnitude of control measures (e.g. staffing, branching and advertisement) and presence of prudential regulations in the banking system.

(i) Operational restrictions and prudential regulations: This explains whether or not there are operational restrictions pertaining to staffing, bank branching and advertising, among others and establishment of new securities markets. The absence of prudential regulation in the banking sector until 1987 is graded as 0, presence of prudential regulation up to 2000 as 1 and onwards as 2.

(ii) Securities market development: Existence of securities market since 1984 is graded as 1 until 1993; stock market was reformed later and is graded as 2. Foreign investors are not allowed to participate in the stock market.

(e) *Restriction in International Financial Transactions (CAPITAC):* International financial transactions comprise presence of multiple exchange rates and restrictions on current account & capital account convertibility.

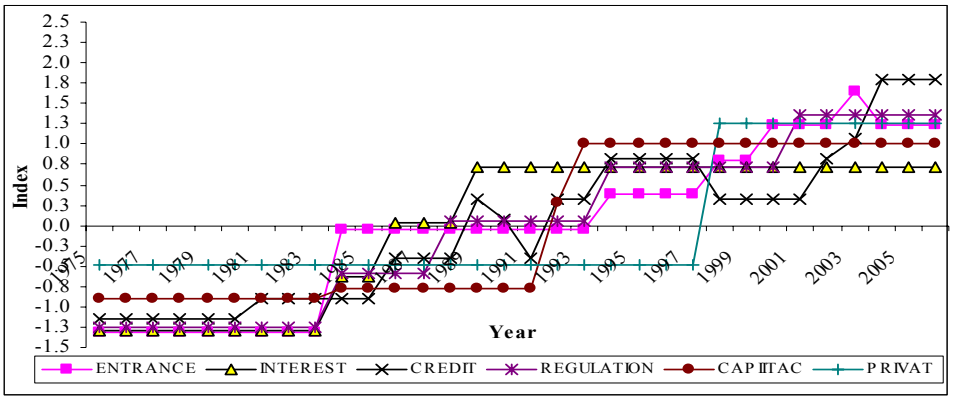
(i) Restriction on current account convertibility: Current account was convertible partially in 1992 and fully since 1993. Therefore, it is graded as 0 up to 1991, 2 for 1992 and 3 onwards.

(ii) Restriction on capital account convertibility: Capital account convertibility captures four components: control on investment outflow, foreign direct investment (FDI), portfolio flows and multiple exchange rates. Investment outflows and portfolio investment are prohibited and ranked by 0 for the whole period. Foreign direct investment was partially allowed (in the financial sector) since 1984; more sectors were opened since 1993. Therefore, it is graded as 0 before 1984; 1 up to 1993 and 2 onwards. Multiple exchange rates were present until 1991 (ranked 0), brought into single rate in 1991 (ranked 1) and market forces were allowed to determine exchange rate since 1992 with frequent interventions of the NRB (ranked 2).

(f) *Privatization of the Financial Sector (PRIVAT):* Policies relating to privatization explain the level of privatization of the public sector banks and financial institutions. It was in 1998 that Nepal Bank Limited was divested by 10 percent to limit government ownership to 40.5 percent. Therefore, it is graded 0 until 1997 and 1 onwards.

When controls were lifted, there were jumps of more than one unit along that dimension. Reversal or impositions of controls were also recorded in the form of shifts from a higher to a lower score. The index allows for distinguishing the dimensions of financial sector reforms, year of major reforms undertaken and minor policy changes as well as policy reversal. The financial liberalization index is fitted in Figure 1.

FIGURE 1: Financial Liberalization Index



Source: Appendix 2.

Index of Financial Development

A well-developed financial system mobilizes savings and allocates resources efficiently, diversifies risks, induces liquidity, reduces both information and transaction costs and provides alternative to raising funds. There are an array of agents and institutions involved in the activities of financial intermediation. In a diversified financial system, the selection of variables to represent the level of financial services generated and measures the extent and efficiency of financial intermediation is not an easy task. Financial deepening can be measured by the intermediaries' ability to mobilize savings, facilitate transactions, reduce information and transaction costs and manage risks. However, valid and reliable data are not readily available and, hence, the proxy so far taken is not perfectly satisfactory. Broad money supply (M2) is considered to be a proxy for the liquidity in the economy.

The natural logarithms of the following variables are used as the proxies while generating the index of financial development covering the period 1975 to 2006. They are: (a) ratio of liquid liabilities of the financial system to GDP (DEPTH), (b) ratio of credit to private sector to GDP (PRIVY), (c) ratio of domestic assets of commercial banks to the sum of domestic assets of Nepal Rastra Bank and commercial banks (BANK), and (d) ratio of private sector credit to total loans and advances of commercial banks (PRIVATE).

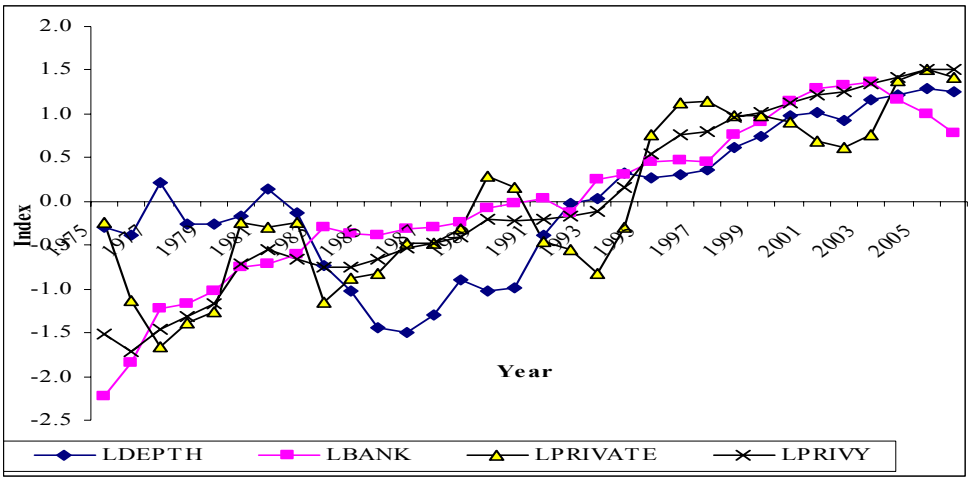
(a) *Liquid Liabilities* (DEPTH) is the ratio of liquid liabilities of the financial system, i.e., the sum of currency, demand and time deposits liabilities of financial intermediaries to GDP [King and Levine (1993a) have used this measure].

(b) *Private Credit* (PRIVY) is the ratio of commercial bank credit to the private sector to GDP. It excludes credit to the public sector and cross claims of one group of banks on another [however, King and Levine (1993 a, b) have used the credit issued by the central bank and development banks as well].

(c) *Bank* (BANK) is the ratio of domestic assets of commercial bank to the sum of domestic assets of commercial banks and the central bank. It measures the degree of credit allocation by the commercial banks. The motive behind this measure is that commercial banks identify profitable investment, monitor managers, facilitate risk management, and mobilize savings more than the central bank.

(d) *Private Sector Credit* (PRIVATE) is the ratio of commercial banks' credit to the private sector to their total loans and advances. It measures the extent of bank credit to the private sector out of their total loans and advances. The index of financial development is illustrated in Figure 2.

FIGURE 2: Index of Financial Development



Source: Appendix 2

V. ANALYSIS AND INTERPRETATION

Statistical examination of liberalization has two major challenges. Firstly, the policy changes tend to be periodic and triggers for these events need to be identified. The events move both ways, towards liberalization as well as reversals in the long-run process. Secondly, identification of dynamic process also leads to cumulative transformations. Since financial sector reform is an ingredient of overall economic reforms, it is difficult to extricate its effects from the reforms in other sector of the economy. Further, the task of reforms is not straightforward but with numerous pitfalls. Generally, it seems clear that

financial liberalization has contributed to mobilize resources through the formal financial system and improved efficiency of allocation.

TABLE 1: Correlation Matrix

VARIABLES	DEPTH	BANK	PRIVATE	PRIVY	ENTRANCE	INTEREST	CREDIT	REGULATION	CAPIITAC	PRIVATE
DEPTH	1.000									
BANK	0.621	1.000								
PRIVATE	0.667	0.774	1.000							
PRIVY	0.740	0.956	0.906	1.000						
ENTRANCE	0.581	0.923	0.800	0.929	1.000					
INTEREST	0.412	0.836	0.721	0.820	0.883	1.000				
CREDIT	0.673	0.837	0.846	0.909	0.869	0.853	1.000			
REGULATION	0.677	0.917	0.844	0.950	0.963	0.904	0.934	1.000		
CAPIITAC	0.797	0.832	0.771	0.887	0.831	0.775	0.865	0.889	1.000	
PRIVATE	0.783	0.749	0.711	0.811	0.775	0.503	0.645	0.741	0.692	1.000

Source: Appendix 2

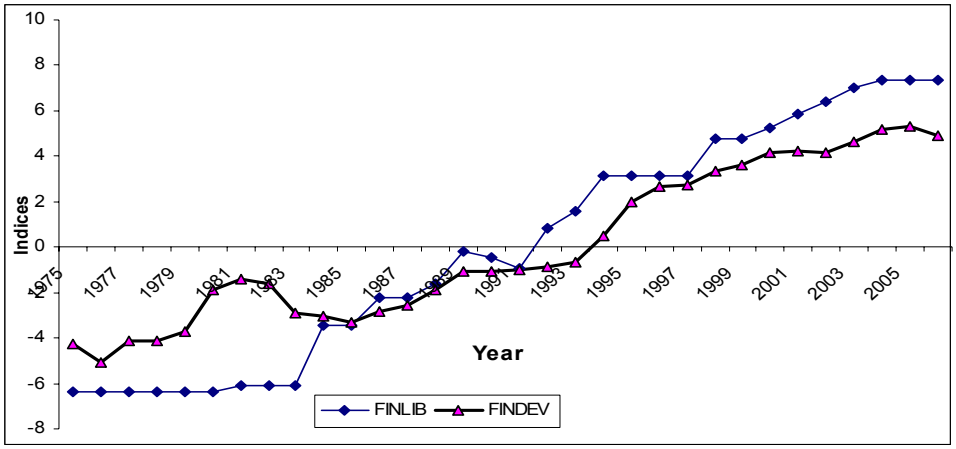
The financial policy variables (credit controls, interest rate controls and controls on international financial transactions) and indicators of financial development are highly correlated with each other. Table 1 shows the correlations among different components of financial liberalization and financial development. The method of principal component is applied to overcome the problem of multicollinearity among the policy variables (financial liberalization and financial development) while quantifying them and constructing the indices of financial liberalization and financial development.

Figure 1 shows the gradual liberalization of the financial sector with partial repression. The reform process has been stretching for more than a decade. Although the process of reforms began in the mid-1980s, the major reforms took place in the late 1980s and comprehensive reforms undertaken after the restoration of democracy in 1990. This index, thus, jointly evaluates the liberalization of the domestic financial sector, the stock market and international financial transaction.

As shown in Figure 2, the index of financial development clearly depicts the development of different variables. The level of financial development was less than average of the overall period before 1993. Among the different variables, LBANK increased more than the others prior to 1981. It was mainly due to the increase in bank lending to the public enterprises and the government. It declined after the initiation of economic stabilization programme in the early 1980s. After liberalization, total domestic assets of commercial banks increased more than that of the central bank. LPRIVATE has an increasing trend but the pace is rather slow over time. LPRIVY has a declining trend before 1980. However, it improved gradually after the initiation of reforms with a smooth growth path until 1994. The emergence of new banks and financial institutions in private sector after 1994 contributed to the growth of the ratio of private credit to GDP since 1994. Further, its growth is affected due to poor investment environment after 1998. LDEPTH (ratio of M2 to GDP) shows an increasing trend at the level above zero since 1989. Its trend is smooth in comparison to the other variables. The declining trend in 1980s improved gradually in the late years of the decade. However, it moved down in the year 1992 due to the adoption of contractionary monetary policy during 1991.

The index of financial development (FINDEV) shows that the development was attributed to the expansion of bank branches before 1980. However, there was a setback in the process of financial development during the early 1980s. An improvement can be observed after the establishment of joint venture banks and partial deregulation of interest rates. The index of financial development shows a variable path of development of the financial system in Nepal. The index turned positive by 1994; however, the extent of development is stagnant with a change each year being less than unity. When the indices of financial liberalization and financial development are put together in Figure 3, both indices are seen to move together.

FIGURE 3: Index Financial Liberalization and Financial Development



Source: Appendix 2

VI. GRANGER CAUSALITY TEST

The indices of financial liberalization and financial development have a rising trend, indicating increase in the degree of financial liberalization and the level of financial development. It refers to the change in the policy i.e. change in the degree of financial liberalization promotes financial development. At the same time, the level of financial development will demand further financial liberalization. In this light, the simple Granger causality technique is applied to find out whether or not there exists any causal relationship between the two series.

TABLE 2: Granger Causality

Granger Causality Tests with Two Lags
Sample period: 1975- 2006

Null Hypothesis:	Obs	F-Statistic	Probability
FINDEV does not Granger Cause FINLIB	30	2.778	0.081
FINLIB does not Granger Cause FINDEV		5.121	0.014

The Granger causality test between the financial liberalization and financial development series suggests that the direction of causality is from financial liberalization

to financial development, since the computed F-statistics (5.121) is greater than the critical value (3.35). The computed F-value of FINDEV to FINLIB (2.78) is not significant statistically and suggests that there is no reverse causation from financial development to financial liberalization at 5 percent level of significance. At 10 percent level of significance, the critical F-value (2.49) is lower than the computed F-value in both the equations indicating bi-directional causality. It shows the existence of bi-directional causality between the FINDEV and FINLIB. However, at the 1 percent level of significance as usual, there is unidirectional causation from financial liberalization to financial development.

VII. CONCLUSION

The analysis of several financial sector policies with the help of a single index of financial liberalization states that financial sector reforms is a process rather than a single moment event. It is clear that after the introduction of financial sector reforms in 1980s, the Nepalese financial sector has widened. The elimination of direct administration of the prices of financial products and private sector participation has contributed to this expansion. Financial liberalization is a process of removing restrictions taking several years to complete. Further, it is also characterized by reintroduction of restrictions at times, but only temporarily. Institutional reforms do not predate liberalization but they are vital for the success of financial sector reforms. It covers information on the quality of institutions as well as laws governing the functioning of the financial system. Improved quality of institutions is likely to reduce financial instability. This analysis shows that the process of financial reforms in Nepal is rather slow. During recent years, reforms are concentrated mainly on improving the financial health of large state-owned banks as well as capacity enhancement of central bank and other institutional improvement. The reorganization and reforming the Nepal Stock Exchange has raised the scope of financial market in Nepalese financial system. Global revolution in information technology and the country's integration with the rest of the world requires the financial sector to be more competitive and updated with recent financial products.

The estimated indices show liberalization of the financial sector and thereby steady financial development in Nepal. Financial development is not only caused by policy changes in the financial sector, but it largely depends on the demand of financial services in the economy. The development of the financial sector is vital for economic development of a country. But it cannot be achieved in isolation with the other sectors of the economy. Simultaneous growth in all the sectors of the economy can raise more demand of financial services and it can stimulate financial development. Unidirectional causality from financial liberalization to financial development (at 5 percent level of significance) found from the Granger causality test depicts this practical situation. At 10 percent level of significance, there is bi-directional causal relationship between financial liberalization and financial development.

APPENDIX 1: Chronology of Financial Sector Reforms

1. Removal of Entry Barriers

1A. Policy Measures	*Year*	*Desired Objectives*
Entry barriers were eased for joint venture banks.	1984	Increase private sector participation to foster competition in the financial sector
ADB/N was allowed to undertake commercial banking activities	1984	Foster competition in mobilizing resources from the urban areas to lend in the agricultural sector.
Establishment of Citizen Investment Trust	1991	Mobilize contractual saving
Establishment of Regional Rural Development Banks	1993	Enhance access of rural poor to the formal credit
1B. Legal and Institutional Reforms		
Enactment of Finance Company Act 1985	1985	Avail consumer credit and promote competition
Establishment of Credit Information Bureau	1989	Discourage risky lending, enhance recovery of loans
Creation of Rural Self Reliance Fund	1991	Improve rural credit system
Introduction of Privatization Act	1994	Minimize government's role in public sector utilities
Enactment of International Financial Centre Act	1997	Develop a regional offshore financial centre
Enactment of Financial Intermediaries act	1999	Formalize the informal finance
Enactment of Nepal Rastra Bank Act	2002	Increase autonomy
Establishment of Debt Recovery Tribunal	2003	Reduce NPL
Enactment of BFI Ordinance	2004	Umbrella Act to remove legal fragmentation

2A. Interest Rate Controls

	Year	*Desired Objectives*
Interest rate regulated by NRB. Minimum rate on saving and one year fixed deposit were fixed at 4 and 6 percent.	1966	To make deposit interest rates on savings competitive to that of India.
Interest rates were revised upwards to minimize the impact of the negative real rates. • Interest rates on savings and one year fixed deposit interest rates increased by 0.5 and 1.5 percentage to 5 and 8.5 percent respectively. • Interest rates on call deposit were introduced. • Slack season and busy season rates were fixed at 3.5 and 4.5 percent respectively.	1971	Encourage saving mobilization.
Introduction of new lending rates ranging from 7 to 13 percent	1971	Encourage investment
Introduction of subsidized interest rates 3.5 to 10 percent for agricultural and 7.5 percent for industrial sector.	1971	Protect agricultural and industrial sectors.
Interest rates raised upwards on savings	1974	Maintain positive real interest rate
Upward revision of overall interest rate structure of commercial banks at 15 percent per annum on fixed deposit and higher bank loans 15 to 18 percent	1975	Effectively mobilize domestic saving and control capital flight
Deposit rates sliced down gradually	1977	Reduce the lending rates
Commercial banks were restricted from accepting deposit from foreign institutions	1978	Discourage capital inflow to ease monetary control

2B. Interest Rate Liberalization

	Year	*Desired Objectives*
Banks were free to offer interest rate on deposits above a band of 1 to 1.5 percent than fixed by the Nepal Rastra Bank.	1984	Promote competition; increase deposit rate.
Banks were allowed to fix their own interest on both deposit and loans within a floor and ceilings respectively.	1986	Enable the market to determine interest rate competitively
Inter-bank borrowing was allowed.	1986	Enable banks to manage short term liquidity problems
Complete deregulation of interest rates.	1989	Market forces determine interest rate freely
Redesigning of Nepal Rastra Bank refinance facilities	1989	Solve liquidity problem of banks
Treasury bills auction	1988	Deny cheap funds to the government
Narrow down interest rate spread	1993	Reduce the spread between deposit and lending rates
Abolition of spread regulation	2002	Allow efficient allocation of credit

3. Credit Control and Deregulation

3A. Credit Ceilings	*Year*	*Desired Objectives*
Credit ceiling of 13.5 percent (to that of previous year) was imposed so that no commercial banks could expand their credits in excess	1986	Contain inflation by reducing money supply and curbing down aggregate domestic credit
Abolition of credit ceiling	1989	Freeing banks to extend credit
3B. Directed credit		
Priority Sector Credits		
5% of Total Deposit	1974/75	Avail credit to small and medium projects and diversify risk of credit concentration, encourage productive sector, avail credit to excluded and small sectors of the economy
7% of Total Deposit	1976/77	
8% of Total Lending	1981/82	
10% of Total Lending	1985/86	
12% of Total Lending	1991/92	
While deprived sector credit would remain intact, priority sector credit will be gradually phased out by 2007/08 as follows:		Reduce operating cost and loan default and increase profitability of the banking sector, and make efficient use of fund
7 percent	2002/03	
6 percent	2003/04	
4 percent	2004/05	
2 percent	2005/06	
2 percent	2006/07	
3C. Cash Reserve Requirement		
9 percent	Until 1989	Gradually reduce the CRR so as to free more resources to avail credit to the private sector.
2 percent	1990-97	
0 percent	1998-2001	
9 percent	2002	
6 percent	2003-04	
5 percent	2005-06	
3D Statutory Liquidity Requirement *(SLR): Lifted*	1989	Allow banks to choose portfolio of their own.
Reintroduced	1991	Mop up excess liquidity from the economy.
Abolished	1993	Remove direct control

4. Regulation of Financial Institutions and Securities Market

4A. Prudential Norms for Banks

I.	Capital adequacy ratio, income recognition, loan classification and loan loss provisioning, and single borrower limit	1988	Achieve financial stability through market discipline while discouraging risk exposure and maintain accounts uniformly with that of international practice.
	a. Capital adequacy ratio 5.0 %	1988	Ensure sound and healthy financial system in line with international best practices
	8.0 %	1991	
	12.0%	2002 onwards	
	b. Core capital adequacy ratio of risk weighted assets and off-balance sheet transaction 2.5%, 4.0 %, 6.0 %	1991, 1992 and 1993	Increase franchise value of banks and hence reduce their vulnerability
II.	Allocation of risk factors on off-balance-sheet items.	1991	Safeguard solvency of the financial system
III.	Risk based loan classification and provisioning for loss	1989	Promote stability.
IV.	Interest income recognition on cash basis	1989	Discourage overspending tendency
V.	Single borrower obligation	1989	Control banks' risk exposure and widely avail credit

4B. Securities Market Reform

Establishment of Securities Exchange Centre	1977	Develop the capital market for long term investment.
Enactment of Securities Exchange Act	1984	Enhance the capital market.
Nepal Stock Exchange Ltd (NEPSE) revamped	1994	Develop a modern securities market.
Formation of Security Exchange Board	1994	Regulate the stock market activities.
Introduction of Code of Conduct for Security Agents	2003	Encourage self-discipline.
Issued directives on transaction of securities	2004	Regulate securities market prudently.

5. Privatization in the Financial Sector

New industrial policy further eased entry barriers in all the sectors of economy including financial sector	1992	Encourage private sector participation in the financial sector
Divestment of 10 percent of public sector share from Nepal Bank Limited	1998	Encourage private participation in the bank and improve work culture and efficiency

6. Restriction on the International Financial Transactions

6A. Reforms in the exchange rate regime:		Market determined exchange rate
i Devaluation of NRs against US$ by 14.7%	1985	Encourage exports
ii Partial convertibility of current account	1992	Achieve article VIII status in the IMF
a. At a ratio of 65: 35		
b. At a ratio of 75:25		
c. Full convertibility of Rupee in current account	1993	
6B. Foreign currency denominated bank accounts		
Nepali citizens permitted to open foreign currency accounts		Lower the cost of international transactions
i Up to 30 % of earning in convertible currency	1992	Encourage inflow of forex in banking system
ii Up to 50 % of earning in convertible currency	1993	
iii Up to 100 % of earning in convertible currency	1994	
6C. Borrowing in convertible currencies from commercial banks		Provide incentive to exports and promote competition
i Short term loans for export-industries and small scale power generating entities	1993	
ii Import of raw wool for carpet industries and specified imports from India	1993	
iii Amortization of principal and interest in FC	1994	

Sources: Acharya et. al (1998) and various publications of Nepal Rastra Bank and Government of Nepal.

APPENDIX 2: Indices of Financial Liberalization and Financial Development

	FINANCIAL LIBERALIZATION							FINANCIAL DEVELOPMENT				
	ENTRANCE	INTEREST	CREDIT	REGULATION	CAPIITAL	PRIVATE	*FINLIB*	LDEPTH	LBANK	LPRIVATE	LPRIVY	*FINDEV*
1975	-1.31	-1.29	-1.14	-1.25	-0.90	-0.49	*-6.37*	-0.29	-2.22	-0.24	-1.51	*-4.26*
1976	-1.31	-1.29	-1.14	-1.25	-0.90	-0.49	*-6.37*	-0.39	-1.85	-1.13	-1.72	*-5.08*
1977	-1.31	-1.29	-1.14	-1.25	-0.90	-0.49	*-6.37*	0.21	-1.23	-1.67	-1.46	*-4.15*
1978	-1.31	-1.29	-1.14	-1.25	-0.90	-0.49	*-6.37*	-0.27	-1.17	-1.39	-1.32	*-4.15*
1979	-1.31	-1.29	-1.14	-1.25	-0.90	-0.49	*-6.37*	-0.26	-1.02	-1.27	-1.16	*-3.71*
1980	-1.31	-1.29	-1.14	-1.25	-0.90	-0.49	*-6.37*	-0.16	-0.76	-0.23	-0.71	*-1.86*
1981	-1.31	-1.29	-0.89	-1.25	-0.90	-0.49	*-6.12*	0.15	-0.71	-0.30	-0.55	*-1.41*
1982	-1.31	-1.29	-0.89	-1.25	-0.90	-0.49	*-6.12*	-0.13	-0.61	-0.24	-0.65	*-1.63*
1983	-1.31	-1.29	-0.89	-1.25	-0.90	-0.49	*-6.12*	-0.73	-0.30	-1.15	-0.75	*-2.92*
1984	-0.04	-0.62	-0.89	-0.59	-0.78	-0.49	*-3.42*	-1.02	-0.37	-0.88	-0.74	*-3.01*
1985	-0.04	-0.62	-0.89	-0.59	-0.78	-0.49	*-3.42*	-1.45	-0.38	-0.82	-0.65	*-3.30*
1986	-0.04	0.04	-0.41	-0.59	-0.78	-0.49	*-2.26*	-1.50	-0.31	-0.47	-0.53	*-2.81*
1987	-0.04	0.04	-0.41	-0.59	-0.78	-0.49	*-2.26*	-1.30	-0.29	-0.47	-0.48	*-2.54*
1988	-0.04	0.04	-0.41	0.06	-0.78	-0.49	*-1.61*	-0.90	-0.25	-0.32	-0.41	*-1.88*
1989	-0.04	0.71	0.33	0.06	-0.78	-0.49	*-0.21*	-1.03	-0.08	0.28	-0.21	*-1.04*
1990	-0.04	0.71	0.08	0.06	-0.78	-0.49	*-0.45*	-1.00	-0.02	0.16	-0.23	*-1.09*
1991	-0.04	0.71	-0.41	0.06	-0.78	-0.49	*-0.94*	-0.39	0.04	-0.45	-0.21	*-1.02*
1992	-0.04	0.71	0.33	0.06	0.29	-0.49	*0.86*	-0.03	-0.13	-0.55	-0.18	*-0.89*
1993	-0.04	0.71	0.33	0.06	1.00	-0.49	*1.57*	0.03	0.24	-0.82	-0.11	*-0.67*
1994	0.38	0.71	0.82	0.72	1.00	-0.49	*3.14*	0.33	0.31	-0.30	0.16	*0.51*
1995	0.38	0.71	0.82	0.72	1.00	-0.49	*3.14*	0.26	0.45	0.76	0.54	*2.01*
1996	0.38	0.71	0.82	0.72	1.00	-0.49	*3.14*	0.31	0.46	1.13	0.75	*2.66*
1997	0.38	0.71	0.82	0.72	1.00	-0.49	*3.14*	0.35	0.45	1.14	0.79	*2.73*
1998	0.81	0.71	0.33	0.72	1.00	1.25	*4.80*	0.62	0.76	0.97	0.95	*3.31*
1999	0.81	0.71	0.33	0.72	1.00	1.25	*4.80*	0.74	0.91	0.98	1.01	*3.64*
2000	1.23	0.71	0.33	0.72	1.00	1.25	*5.23*	0.98	1.14	0.90	1.12	*4.14*
2001	1.23	0.71	0.33	1.37	1.00	1.25	*5.88*	1.01	1.29	0.69	1.21	*4.20*
2002	1.23	0.71	0.82	1.37	1.00	1.25	*6.37*	0.93	1.33	0.62	1.25	*4.13*
2003	1.65	0.71	1.06	1.37	1.00	1.25	*7.04*	1.17	1.37	0.76	1.35	*4.65*
2004	1.23	0.71	1.80	1.37	1.00	1.25	*7.35*	1.21	1.16	1.38	1.42	*5.18*
2005	1.23	0.71	1.80	1.37	1.00	1.25	*7.35*	1.29	0.99	1.51	1.51	*5.30*
2006	1.23	0.71	1.80	1.37	1.00	1.25	*7.35*	1.25	0.77	1.42	1.50	*4.94*

Sources: *Quarterly Economic Bulletin, Economic Survey* and own computations

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Stock Returns and Economically Neutral Behavioural Variables: Evidence from the Nepalese Stock Market

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This article investigates whether or not the Nepalese stock market is efficient in weak form with respect to economically neutral behavioural variables. Simple OLS technique with White's heteroskedasticity-corrected standard errors is used to test the relationship between stock returns and economically neutral behavioural variables represented by weather (cloud cover and temperature) and biorhythms (seasonal affective disorder). The findings indicate the existence of weak-form efficiency in the market for "temperature" and "seasonal affective disorder" but not for the "cloud cover". These findings are not consistent to those of results documented for developed and emerging stock markets.

I. INTRODUCTION

There is a growing research in the field of behavioural finance that examines the effect of moods and feelings on stock market returns. These studies argue that economically neutral behavioural variables (mood proxy variables) influence the mood of investors, which in turn influence the stock returns (Jacobsen & Marquering, 2004). These variables are categorized as a continuous or of a single event (Edmans, Garcia & Norli, 2006). Examples of the continuous variable are weather (cloud cover or sunshine and temperature), seasonal affective disorder (biorhythms) and lunar cycle while that of a single event are daylight savings time changes (biorhythms), nonsecular holidays and international soccer results.

The seminal work in this aspect is that of Saunders (1993). He finds that for the US, cloud cover is significantly and negatively correlated with stock returns. Focusing on the three indices—the DJIA index, value-weighted index and NYSE/AMEX equal weighted index—he documents that less cloud cover (sunshine) is associated with higher returns and the return differences between the categories with the most cloud cover and that with

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the least cloud cover is statistically significant. He further shows that the results are robust with respect to a variety of market "anomalies" including the January, weekend, and small firm effects and are also not unduly influenced by infrequent, large returns on stock (2 percent or more). Hirshleifer and Shumway (2003) make a detailed study on the Saunders findings by focusing on the 26 international stock exchanges for the period from 1982 to 1997. [1] Using simple regression and logit model they confirm Saunders findings and also show that the results remain consistent even after controlling for adverse weather conditions such as snow and rain. The research on this was given further impetus when Cao and Wei (2004, 2005) found a statistically significant and negative correlation between temperature and stock returns. Furthermore, they show that the result is robust to various alternative tests and specifications, and it remains strong even after controlling for the geographical dispersion of investors relative to the city. In an expansion on the investigation of weather variables, recent research has argued that there is a connection between biorhythm and stock returns. For instance, Kamstra, Kramer and Levi (2000) report that stock returns following daylight savings time changes are significantly more negative due to sleep disruptions. Accordingly Kamstra, Kramer and Levi (2003) show that stock markets experience the highest returns during the short, dark days of winter and the lowest returns during the long bright days of summer. They attribute this to risk aversion resulting from Seasonal Affective Disorder (SAD). [2] In a similar vein Dichev and Janes (2001) and Yuan, Zheng and Zhu (2001) illustrate the negative relationship between stock returns and lunar phases. Further, Frieder and Subrahmanyam (2001) argue that for US, nonsecular Jewish holy days (on which the US stock market opens) have significant impact on equity prices.[3] Moreover, average return is significantly positive for the days surrounding Rosh HaShanah (Jewish New Year) and significantly negative for Yom Kippur (the Day of Atonement) and the day after. A recent study by Edmans, Garcia and Norli (2006) however use international soccer outcomes as a mood proxy variable. They document a significant decline in stock returns after soccer losses. Moreover, the loss effect is stronger in small stocks and in more important games, and is robust to methodological changes. The relationship between the stock returns and economically neutral behavioural variables has not been yet explored for the Nepalese stock market. It is the purpose of this study to test for such relationship by focusing on three mood proxy variables, all continuous: two of these are the weather variables (cloud cover and temperature) and the third one is a biorhythm variable (SAD). The benefit of use of data from single country against multi-country is that it takes into account the market structure, customs and culture specific to that country.

The paper is organized as follows. Section II discusses previous studies on the mood proxy variables and stock returns. Section III describes the data and methodology employed for the study. Section IV consists of the empirical analysis and findings of the study. The final section concludes the study.

[1] This study tests deseasonalised cloud cover instead of absolute cloud cover. This measure is argued to lead to a more accurate measure of the relationship between cloud cover and equity prices, as it avoids the possibility of identifying a relationship that is a proxy for other seasonal affects. However, no psychological literature is cited to support this argument.

[2] The mild version is called "winter blues". SAD results from reduced sunlight or daylight hours during the fall and winter months. Details are available in Kamstra *et al*, 2003.

[3] Jews form only about 2% of the U.S. population.

II. Review of Literature

This section reviews the global findings on the relationship between the stock returns and economically neutral behavioural variables represented by weather (cloud cover and temperature) and biorhythms (SAD).

Weather and Stock Returns

Weather has long held a central place in human experience, and if lay psychology is to be believed, weather continues to be an important determinant of everyday mood and behavior in modern life (Persinger, 1980; Watson, 2000; quoted in Keller, et al., 2005, p. 724). Saunders (1993) is the first to study the effects of cloud cover on stock returns.[4] For the sample period of 1927 to 1989 (Dow Jones Industrial Average (DJIA)) and 1962 to 1989 (New York Stock exchange (NYSE) /American Stock Exchange (AMEX)), he categorizes cloud cover into two categories (0-20 and 100) and then computes average returns for each categories for three indices. He finds that very sunny weather (0-20) and totally cloudy weather (100) influences stock prices. Further the effect is more pronounced on sunny days for most of the NYSE/AMEX data. [5] Saunders shows that the findings are robust with respect to a variety of market "anomalies" including the January, weekend, and small firm effects and are not unduly influenced by infrequent, large returns on stock (2 percent or more). Kramer and Runde (1997) replicate the findings of Saunders (1993) using German data and conclude that short term stock returns are not affected by local weather and argue that results of Saunders may be due to Type I error.

Hirshleifer and Shumway (2003) make a detailed study on the weather effect by citing several psychological literatures of moods effect on decision making and then focusing on the 26 international stock exchanges for the period from 1982 to 1997. Using simple regressions and logit model they find that sunshine is very significantly correlated with stock returns. Even after controlling for adverse weather conditions such as snow and rain, they find sunshine to be very significantly correlated with both the sign and magnitude of returns. Instead of studying sunshine or cloud cover Cao and Wei (2004, 2005) examine this relationship for 8 international stock exchanges using the temperature as a weather variable.[6] They cite the relevant psychological literature and hypothesize that lower temperature is associated with higher stock market returns due to aggressive risk taking, and higher temperature can lead to either higher or lower stock returns since both aggression (associated with risk-taking) and apathy (associated with risk-averting) are possible behavioural consequences and the net impact on investors risk taking depends on

[4] Saunders uses this weather variable because it represents or is highly correlated with those variables (hours of sunshine, humidity, precipitation) that previous research (psychological) has found to be most influential on mood. Further New York City weather is used as a proxy on the assumption that it is the "local trading agents" (marginal investors or investment professionals) on the floor of the exchanges that affect prices rather than other market participants who are geographically dispersed.

[5] But he notes that sunshine effect is insignificant in recent samples (1983-1989).

[6] This consists of New York, Toronto, London, Frankfurt, Stockholm, Sydney, Tokyo and Taipe. They also examine additional 19 stock exchanges to test the robustness of the effect. 23 of 27 international stock exchanges examined are similar to that employed by Hirshleifer and Shumway (2003). 19 of these end in 1997 whereas six end in 2001, one in 1999 and one in 2000. The starting period, however, differs for each.

the trade-off between the two. [7] The authors find that stock returns are negatively correlated with temperature: the lower the temperature, the higher the returns, and vice versa. They called this as anomaly and mention that this relationship is slightly weaker in the summer than in the winter, implying that when the temperature is high, apathy dominates aggression, resulting in lower returns. Nevertheless, a statistically significant, overall negative correlation exists between temperature and stock returns. They further show that their result is robust to various alternative tests and specifications, and it remains strong even after controlling for the geographical dispersion of investors relative to the city.

While most of the research papers document evidence of weather effect there are also counter evidences on such existence, for instance, Pardo and Valor (2003) on Spanish stock returns using sunshine hours and humidity level, Tufan and Hamrat (2003) on Turkish stock returns using cloud cover and Loughran and Schultz (2003) for NASDAQ stock returns using cloud cover. Moreover, Goetzmann and Zhu (2002) find that weather effect is due to behavior of market makers rather than individual investors. They confirm the results of Saunders (1993) and Hirshleifer and Shumway (2003) for New York City weather but when they examine database of the trading accounts of investors for the period January 1991 to November 1996, which represents about 40 percent of total individual records and includes cities from eastern and western parts of US, they find virtually no difference in the propensity to buy or sell equities on cloudy days as opposed to sunny days trading patterns attributable to the weather and hence rule out individual traders as the source of weather effect. In addition, they also ruled out institutions as likely candidates by presenting two reasons. First, they are typically assumed to be more sophisticated and less susceptible to behavioural biases than individuals. Secondly, they are geographically dispersed like individual investors so that they should also be less influenced by the local weather of New York City. Therefore the market makers act as the last candidate attributing to the source of the weather effect. For this they hypothesize that total sky cover has no significant influence on liquidity (using bid–ask spread as a measure) and examine the daily relation between the average spread change and the local New York City weather. They conclude that spread widens on cloudy days and hence the lower returns on these days.[8]

Biorhythms and Stock Returns

In an expansion on the investigation of weather-related mood proxy variables, recent research has argued that there is a connection between biorhythm (a hypothetical cyclic pattern of alterations in physiology, emotions, and/or intellect) and stock returns. This

[7] For the psychological research papers see Cao and Wei (2004, 2005). Jacobsen and Marquering (2004, p.7) argue that these research papers relate to the experiments on temperature and human behavior under extreme warm and extreme cold temperatures which investors do not frequently experience since in most countries in their study, temperatures are closer to moderate temperatures. In another study (Theissen , 2003, p.10) for German private investors, the finding is that there is no relationship between implied returns (returns based on forecast value and previous trading day) and the average daily temperature but for other prevailing weather (sunshine, cloud cover and rain) there exists relationship but not monotonic.

[8] This follows from Chordia et al. (2001, quoted in Goetzmann & Zhu 2002, p. 13) who show that there is the negative relationship between spread change and stock returns.

research can be argued to be motivated by the same arguments that motivate the research on the relationship between the weather and equity returns. The Seasonal Affective Disorder (SAD) is the biorhythm mood proxy used in this regard. The SAD (in the northern hemisphere) essentially is a seasonally recurrent depression with typical onset during the autumn or winter and remission in the spring or summer (Magnusson, 2000). The prevailing explanation of autumn-winter SAD is that it is a biological response to seasonal change in the photoperiod (hours of daylight). Research shows that rates of autumn winter SAD will tend to increase with latitude, because of the increased seasonal differences in daylight hours. Accordingly, experimental research in psychology documents a clear link between depression and lowered risk-taking behavior in a wide range of settings, including those of a financial nature. Through the links between SAD and depression and between depression and risk aversion, Kamstra *et al*. (2003) hypothesize that seasonal variation in length of day can generate seasonal variation in equity returns. [9] Using daily data from nine international stock exchanges (the sample period varies with longest time series of 70 years and shortest time series of 10 years) located at various latitudes around the world—from Sweden in the northern hemisphere to New Zealand in the southern hemisphere—they show evidence of significant SAD effect in the seasonal cycle of stock returns (i.e. stock markets experience the highest returns during the short, dark days of winter and the lowest returns during the long, bright days of summer) and it holds even after controlling for well-known market seasonals and other environmental factors. The study also finds that SAD effect is more pronounced in the markets at higher latitude (i.e. furthest from the equator) irrespective of whether market is located in the northern and southern hemispheres, although the southern markets, where the seasons are reversed, react six months out of phase. In addition they find that SAD effect is asymmetric by including the fall dummy variable. [10]

The psychological links that Kamstra *et al*. (2003) suggest have recently been criticized by Kelly and Meschke (2005). They argue that psychological (and/or medical) literature that links time varying depression to time varying risk aversion has not yet been established (although the cross-sectional relation between depression and risk aversions has been established). They also claim that other studies found that depression peaks as the SAD did not occur during the fall but during the period December-February. Jacobsen

[9] Based on the incidence of medical evidence on SAD, this seasonal relates to the length of day, which depends on season and latitude, not with amount of *sunshine*, which depends on cloudiness (Garrett, Kamstra & Kramer, 2004).

[10] Psychological literature (Kamstra *et al.*, 2003) suggest the depressive effects of SAD and hence risk aversion may be asymmetric about winter solstice. Thus, two dates symmetric about winter solstice (December 21) have the *same length of night* but possibly *different expected returns*. In this background, Kamstra et al. (2003) anticipate unusually low returns before winter solstice (fall) and abnormally high returns following winter solstice (winter). Lower returns should commence with fall, as SAD-influenced individuals begin shunning risk and rebalancing their portfolios in favor of relatively safe assets. They expect this to be followed by abnormally high returns when days begin to lengthen and SAD-affected individuals begin resuming their risky holdings. As long as there are SAD sufferers shunning risk at some time of the year relative to other times, market returns will contain seasonals. This has been further clarified by Kelly and Meschke (2005, p.2) as follows: "With the onset of winter depression results in greater risk aversion in investors affected by seasonal depression, who therefore sell stock, decreasing prices in the fall (and hence lower expected return) as the days get shorter. As the days lengthen and the mood of the seasonally depressed investors improves in winter, they buy stock, driving up prices (and hence higher expected return). This generates cyclical pattern of lower returns in fall followed by higher returns in winter called as “SAD effect”.

and Marquering (2004) further cite the psychological literature to argue that people in positive moods and not depressed state seem to become more risk averse, the reason being that they have the emotional goal of maintaining their mood.

III. DATA AND METHODOLOGY

The equity data consists of 2587 observations of the daily closing values of Nepal Stock Exchange (NEPSE) index. The index is a value weighted and is available on daily basis for eleven years from January 23, 1995 to December 31, 2005. [11] The data are obtained from the Securities Board of Nepal. The daily logarithmetic returns on index are calculated using the following equation.

$$r_t = 100 * Ln(Index_t / Index_{t-1}) \quad \textbf{(1)}$$

where, r_t is the continuously compounded rate of change in stock market index, $Index_t$ is the stock market index at time t and $Index_{t-1}$ is the stock market index at time t-1.

The weather data consists of cloud cover and temperature and are obtained from Government of Nepal, Department of Hydrology and Meteorology. The weather station used is Tribhuvan International Airport (the latitude is 27° 41' 47.3"N) and the sample period corresponds to that of equity data. The choice for using this station is because of nearly complete data availability and because of its proximity to the city of the stock exchange. [12]

Cloud Cover or Total Sky Cover (SKC)

The SKC variable varies from 0 to 8 indicating the percentage of cloud cover; an 8 signifies cloud cover all day (overcast) and 0 indicates the absence of cloud cover all day (fine). The SKC variable under study is measured 3 hourly (the first observation of day being taken at 2.45 a.m. Nepal Standard Time (NST) with the next observations at 5.45 a.m., 8.45 a.m. and so on). For the analytical purpose we calculate the average SKC for each day from 5.45 a.m. to 5.45 p.m. NST to consider NEPSE trading hours. In addition we use the deseasonalised SKC in line with Hirsheleifer and Shumway (2003). This method is argued to capture the impact of daily SKC shock as opposed to overall seasonal impacts on returns.[13] For deseasonalizing, the average cloudiness value for each month of

[11] See www.globalfinancialdata.com for more on the construction of index.

[12] This is in line with Saunders (1993). Saunders argues that local weather effects must work through local trading agents rather than productive agents of listed firms. In addition, market participations in Nepal are much less geographically dispersed (with individual and institutional ownership of stocks mostly concentrated in Kathmandu) vis-à-vis developed markets; so Kathmandu weather is a good proxy. On this, see also Goetzman and Zhu (2002).

[13] Loughhran and Schultz (2003), however, point out two potential problems associated with this procedure. First, it is not clear that investors "seasonalize" weather observations in their heads. That is, it may not be true that investors say, "today is a sunny day in January if I account for yearly overcast trends." The weather today is either sunny or not sunny. Second, it possibly introduces a look-ahead bias into the analysis, for instance, as of the first week in January of 1984, no person could perfectly forecast early January weather patterns for the future 13 years. Not withstanding these caveats, the cloud cover data is deseasonalized as is done by other authors, for instance, Loughhran and Schultz (2003) and Goetzman and Zhu (2002).

the year is calculated; then each month's mean cloudiness is subtracted from each daily mean. For example, the average value of SKC for each month of the year (January through December) is calculated as averages of the 11 observations on SKC for that particular month of the year during our 11-year sample. Finally, the daily seasonally-adjusted SKC (SKC_t*) is computed as the SKC of a particular day minus the SKC of the month (the positive deviation means cloudier than normal day and a negative means the opposite) to which it belongs (All SKC hereafter is season-adjusted SKC (SKC_t*).

Temperature (TEMP)

TEMP variable is in degree celsius. It is measured twice each day at fixed time of 8.45 a.m. NST and at 5.45 p.m. NST. The maximum and minimum temperature observed at that time is reported as maximum and minimum temperature. We calculate the daily temperature in line with Cao and Wei (2004) as the average of maximum and minimum temperature. We then deseasonalise TEMP variable by month in the same way as that for the SKC variable and denote it by $TEMP_t$*.

Seasonal Affective Disorder (SAD)

The SAD variable (SAD_t) is based on the number of hours between sunset and sunrise in the fall and winter. [14] The SAD variable (SAD_t) is given by (Kamstra et al., 2003).

$$SAD_t = \begin{cases} H_t - 12 & \text{for trading days in the fall and winter} \\ 0 & \text{otherwise} \end{cases}$$

where H_t is the time from sunset to sunrise at a particular location (Kathmandu) i.e. number of hours of night, given by standard approximations from spherical trigonometry,

$$H_t = 24 - 7.72 \times \arccos\left[-\tan\left(\frac{2\pi\delta}{360}\right)\tan(\lambda_t)\right]$$

where δ represents the latitude north of the location from the equator (Kathmandu is 27 º 42' North); and λ_t is the sun's declination angle given by

$$\lambda_t = 0.4102 \times \sin\left[\left(\frac{2\pi}{365}\right)(julian_t - 80.25)\right]$$

where $julian_t$ is a variable that ranges from 1 to 365 (366 in leap year) , representing the number of the days in the year. $Julian_t$ equals 1 for January 1 , 2 for January 2 and so on.

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[14] The fall and winter period is defined as September 21 to March 20 for the Northern Hemisphere. The fall and spring equinoxes are assumed to occur on September 21 and March 21, though the timing can vary by a couple of days. By subtraction of 12, SAD_t reflects the length of the night in the fall and winter relative to the mean annual length of 12 hours. Note that by working with hours of night, as opposed to day (number of hours of day from sunrise to sunset), the expected impact of the SAD measure on returns will be positive.

IV. Empirical Analysis and Findings

The first part of this section delineates the summary statistics for the variables under the study and second part reports the empirical findings for the regression model.

Summary Statistics

The summary statistics for stock returns and weather variables are reported in Table 1. For stock returns, the mean is 0.016 percent and the standard deviation is 0.808 percent. The largest single day loss was -8.014 percent and the largest single day gain was 5.958 percent. The stock returns exhibit negative skewness and strong kurtosis. To illustrate the return progressions throughout the calendar year, the historical average daily return is plotted in Figure 1.

TABLE 1: Summary Statistics

Variables	*No of Obs.*	*Mean*	*Std. Dev.*	*Min*	*Max*	*Skewness*	*Kurtosis*
Return (%)	2586	0.02	0.81	-8.01	5.96	-0.62	13.88
Total Sky Cover	3993	3.85	2.27	0.00	8.00	0.05	-1.28
Temperature (^{o}C)	3996	19.11	5.04	4.60	27.45	-0.42	-1.14

Notes: This table displays the summary statistics for the sample period Jan 23, 1995 to Dec 31, 2005. The variable described as return is daily percentage return for NEPSE index. Data regarding index are obtained from SEBO/N. The weather mood proxy variables are daily cloud cover that ranges from 0 to 8 and daily temperature in degree Celsius. Column 2 includes the number of observations for sample period and column 3 and 4 report the mean and standard deviation. Column 5 and 6 show the minimum and maximum value of the variables. The last columns 7 and 8 describe the skewness and kurtosis.

For daily cloud cover, the mean is 3.85 and the standard deviation is 2.27. The largest and lowest cloud cover was 8 and 0 respectively. The skewness is close to zero indicating the existence of symmetrical (normal) distribution while kurtosis is less strong. To illustrate the cloud cover progressions throughout the calendar year, the historical average daily cloud cover is plotted in Figure 2.

For daily temperature the mean hovers around 19°C while standard deviation is close to 5°C. The lowest temperature was 4.60°C and the highest temperature was 27.45°C. The temperature series reflects a negative skewness, indicating that it is more common to have extremely cold days than extremely hot days. To illustrate the temperature progressions throughout the calendar year, the historical average daily temperature is plotted in Figure 3. Figure 4 shows the value of the daily SAD measure. The SAD variable equals 0 at the autumn equinox (September 21), takes on higher values until it

peaks at +2 on winter solstice (December 21), then takes on lower values until it equals 0 at the spring equinox (March 20) and remains at zero through the spring and summer. [15]

Figure 1. Daily stock return

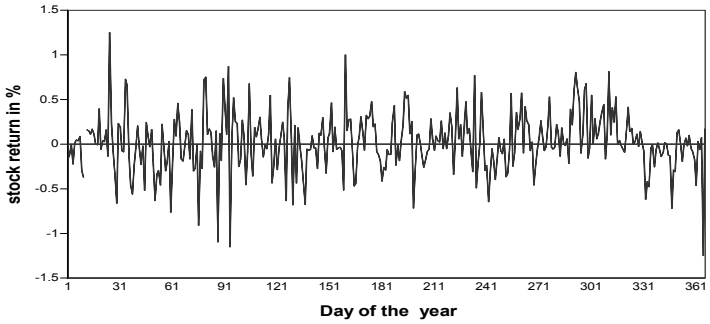
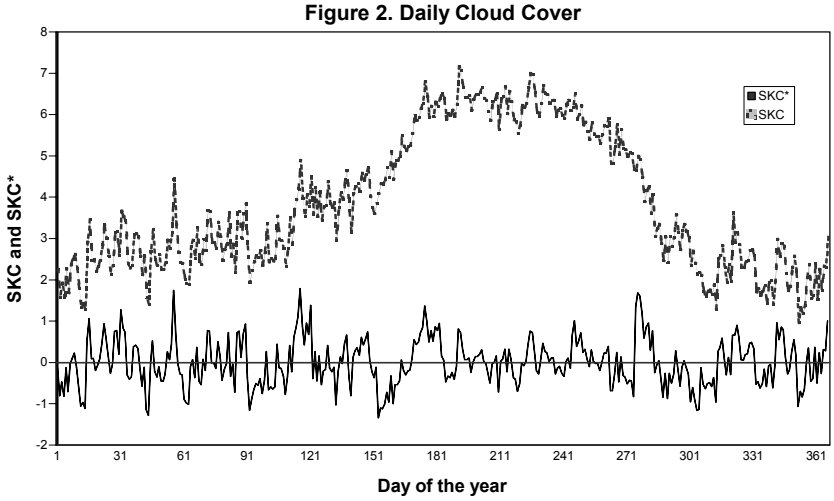


Figure 2. Daily Cloud Cover



[15] For convenience the winter solstice is assumed to take place on December 21 whereas summer solstice to take place on June 21 although the timing may vary by a couple of days (Kamstra *et al*., 2003).

Figure 3. Daily Temperature

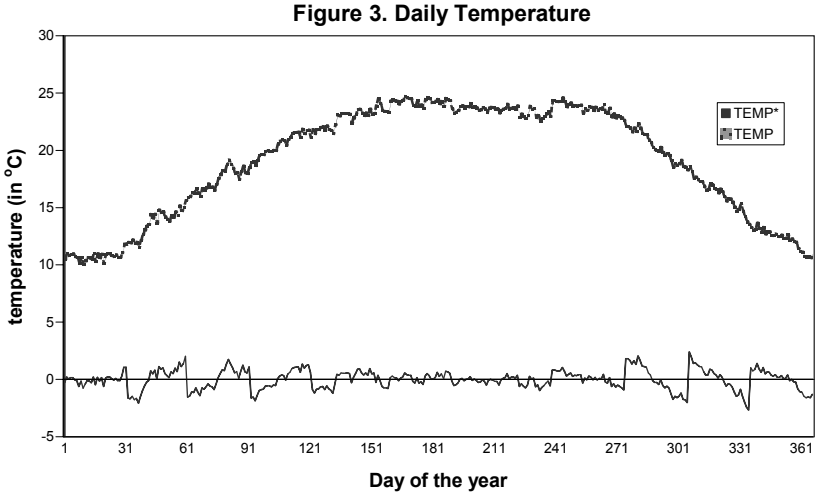
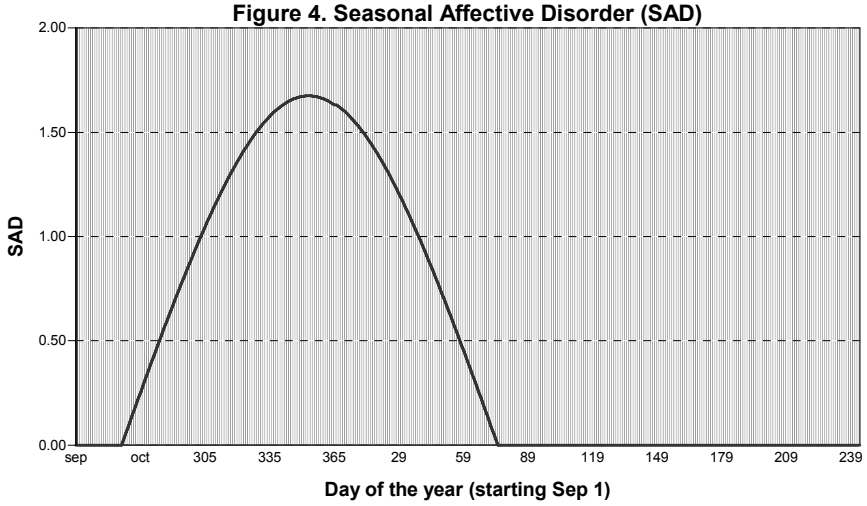


Figure 4. Seasonal Affective Disorder (SAD)



Regression Analysis

To assess the relationship between the economically neutral behavioural variables and stock returns we run the following regressions. Similar to Kamstra et al. (2003) and Cao and Wei (2004), returns (r_t) are regressed on constant (β_0), lagged returns where necessary (one lag is required for NEPSE index[16]) and each of the economically neutral variables (total sky cover, temperature, the SAD). However we do not control for the Monday effect and the tax-loss effect.[17]

$$r_t = \beta_0 + \rho_1 r_{t-1} + \beta_C SKC_t * + \varepsilon_t \quad (2)$$

$$r_t = \beta_0 + \rho_1 r_{t-1} + \beta_T TEMP_t *_t + \varepsilon_t \quad (3)$$

$$r_t = \beta_0 + \rho_1 r_{t-1} + \beta_S SAD_t + \varepsilon_t \quad (4)$$

where variables are as defined in section III except that r_{t-1} is the lagged dependent variable.

Table 2 reports the results from running the regression equations 2, 3 and 4 for the entire sample period. The results indicate that cloud cover coefficient is positive (*t*-statistic = 1.69) and significant at 10 percent level of significance, suggesting that returns increase during the cloudy days. Similar to cloud cover we also document the positive coefficient of temperature but the *t* value is not significant at the conventional level of significance. With regard to the coefficient of SAD, it is negative and statistically insignificant. The value of adjusted R^2 reported in the last column of Table 2 shows that each of the mood proxy variables explain more than eight percent of variation in stock returns. Overall the results indicate that when we include each economically neutral behavioural variables in the regression individually, we find the significant relationship (positive) for the cloud cover only but not for temperature and SAD.

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[16] The lag length is determined using Ljung-Box χ^2 test (Kelly & Meschke, 2005). For this, we first run each regression without lagged returns. If a Ljung-Box χ^2 test rejects the hypothesis of no residual autocorrelation for up to ten lags at the one percent significance level, we include another lag and repeat the procedure up to two lags.

[17] Because Joshi and K.C. (2005) and Joshi (2006) report that tax loss selling effect and Monday (day-of-the-week effect) do not exist for the Nepalese stock market (at the conventional level of significance) we do not include these non weather variable controls in our analysis.

TABLE 2: Regressions results using one economically neutral behavioural variable only: the total sky cover, the temperature and the SAD variable

Explanatory Variables	β_0	ρ_1	SKC*	TEMP*	SAD	Adj.R^2
	0.0109	0.2839	0.0154			
Total Sky Cover	0.71	15.04*	1.69***	-	-	0.0806
	0.0116	0.2842		0.0066		0.0803
Temperature	0.76	15.07*	-	0.86	-	
	0.0218	0.2838			-0.0208	0.0803
SAD	1.13	15.04*	-	-	-0.88	

Notes: This table reports the regression results of estimating a regression of daily stock returns on lagged returns and for each of the economically neutral behavioural variables (cloud cover, temperature and the SAD). The weather variables are deseasonalised (indicated by asterisk) for estimation purpose. The reported *t*-statistics are based on White's heteroskedasticity-corrected standard errors. The sample period covers Jan 23, 1995 to Dec 31, 2005.

* Significant at the 10-percent level, two-sided.

** Significant at the 5-percent level, two-sided

*** Significant at the 1-percent level, two-sided

In order to test the power of each economically neutral variables in the presence of all the other economically neutral variables we run a following regression equation.

$$r_t = \beta_0 + \rho_1 r_{t-1} + \beta_C SKC_t^* + \beta_T TEMP_t^* + \beta_S SAD_t + \varepsilon_t \quad \textbf{(5)}$$

Similar to Kamstra *et al*. (2003) and Cao and Wei (2004), returns (r_t) are regressed on constant (β_0), lagged returns where necessary (one lag is required for NEPSE index) and all economically neutral behavioural variables (total sky cover, temperature, the SAD). As in previous regression equations, we do not control for the Monday effect and the tax-loss effect.

Panel A of Table 3 reports the results from running the regression equation 5 for the entire sample period. The results in Panel A of Table 3 is consistent to that observed for Table 2 when economically neutral variables are included individually in the regression model. For instance, the cloud cover coefficient is positive (*t*-statistic = 1.80) and significant at 10 percent level of significance, the temperature coefficient is also positive but the *t* value is not significant and that the coefficient estimate of SAD is still negative and statistically insignificant. Moreover, the value of adjusted R^2 reported in the last column of Table 3 (Panel A) shows that mood proxy variables still explain more than eight percent of variation in stock returns. Overall the results indicate that there is significant relationship (positive) between stock returns and mood proxy variables represented by the cloud cover.

TABLE 3: Regressions results using all economically neutral behavioural variables (the total sky cover, the temperature and the SAD variable)

	β_0	ρ_1	SKC*	TEMP*	SAD	Adj.R^2
Panel A						
Entire sample	0.0193	0.2841	0.0159	0.0075	-0.0175	
period	0.98	7.09***	1.80*	0.99	-0.76	0.0808
Panel B						
First sub-period	0.0306	0.1182	-0.0002	0.0014	0.0093	
	1.24	4.24***	-0.02	0.17	0.30	0.0110
Second sub-period	0.0032	0.3842	0.0296	0.0185	-0.0260	
	0.10	15.02***	2.06**	1.26	-0.73	0.1512
Panel C						
Commercial	0.0609	0.0471	0.0434	0.0111	-0.0603	
Bank Index	1.18	0.64	1.89*	0.42	-1.19	0.0027

Notes: This table reports the regression results of estimating a regression of daily stock returns on lagged returns and three economically neutral behavioural variables (cloud cover, temperature and SAD).The weather variables are deseasonalised (indicated by asterisk) for estimation purpose. The reported *t*-statistics are based on White's heteroskedasticity-corrected standard errors. Entire sample period covers Jan 23, 1995 to Dec 31, 2005 whereas first and second subsample periods cover Jan 23, 1995 to Jun 30, 2000 and Jul 1, 2000 to Dec 31, 2005 respectively.

* Significant at the 10-percent level, two-sided.

** Significant at the 5-percent level, two-sided

*** Significant at the 1-percent level, two-sided.

To provide further evidence, we report the results for the sub-periods in Panel B of Table 3. For this purpose the entire sample period is cut into two sub-periods with the number of observations across each sub-period approximately equal. As depicted in Table 3 (panel B) the coefficient estimates of cloud cover and SAD are dissimilar across the two sub-periods. During the first sub-period, the coefficient of cloud cover is negative but not significant while that of SAD is positive, again insignificant at conventional level. Notwithstanding during the second sub-period, the coefficient estimate of cloud cover is positive (0.0296) with a statistically significant *t*-statistics of 2.06 while the coefficient of SAD is insignificant and negative. The results indicate that while the returns on cloudy days tend to be lower than that on non-cloudy days during the first sub-period, they tend to be higher than that on non-cloudy days for the second sub-period. In contrast to the cloud cover and SAD, the coefficient estimate of temperature is consistent across the sub periods; the magnitude, however, differs. The mood proxy variables are able to explain more than 15 percent of variation in stock returns for the second sub-period.

Motivated by the documentation of the significant relationship between the cloud cover and stock returns in broad index, we examine whether this effect exists in industry indices. For this we employ NEPSE Commercial Bank index as a proxy index. The results for NEPSE Commercial Bank index are consistent with previous findings on

broad index. For instance, as depicted in panel C of Table 3, the cloud cover coefficient estimate is positive with a statistically significant *t*-statistic of 1.89.

In summary, the results in Table 3 indicate that the relationship between the cloud cover and stock returns is significant and positive. Moreover the result is consistent across broad index and industry index. However, the relationship across the sub-periods are different, they tend to be negative (not significant) during the first sub-period, but positive during the second sub-period. There is no striking pattern regarding other mood proxy variables viz. temperature and SAD.

V. CONCLUSIONS

In this study we extend the research on the nexus between economically neutral behavioural variables and stock returns documented in Saunders (1993), Hirshleifer and Shumway (2003), Cao and Wei (2004, 2005) and Kamstra et al (2003) by examining the Nepalese stock market. In particular we focus on three mood proxy variables, all continuous: two are the weather variables (cloud cover and temperature) and third one is a biorhythm variable (SAD). The results of our study shows that there is significant relationship (positive) between stock returns and economically neutral behavioural variable represented by the cloud cover. This finding is inconsistent to that reported by Saunders (1993) and Hirshleifer and Shumway (2003) who observed significant negative relationship between stock returns and cloud cover.

With respect to temperature and SAD variable we do not observe such significant relationship. These result are also inconsistent to the findings demonstrated in Cao and Wei (2004, 2005) and Kamstra *et al* (2003) who reported the significantly negative relationship between stock returns and temperature and positive and significant relationship between stock returns and SAD variable respectively. Interestingly, our findings are however consistent for the sub-period (the exception is first sample period) and for one of the industrial indexes.

The findings indicate that the Nepalese stock market is not efficient in weak form with respect to the one (cloud cover) of the three mood proxy variables and thus support the arguments for the inclusion of this mood proxy variable in the models of asset pricing. [18] The practical implication is that investors can benefit from becoming aware of their moods, in order to avoid mood–based errors in their judgements and trades (Hirshleifer & Shumway, 2003). However as Jacobsen and Marquering (2004) opine, many things are correlated with the seasons and it is hard to distinguish among them while trying to explain seasonal pattern in stock returns. Therefore, further research should be undertaken to confirm the results of the present study. Moreover, as many behaviorists point out, a useful direction for future experimental research will be to examine the effects of mood or weather on trading behavior (buy and hold decisions) and the extent to which investors who are primed to attend to their moods can make better decisions.

[18] This is one form of "Efficient Market Hypothesis". Other includes semi-strong form and strong form of market efficiency. For the present case, we define a market as weak-form efficient if it is impossible to achieve abnormal profits by using past prices to formulate buying and selling decisions. See Fama (1970, 1991).

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- Goldstrein, Morris, and Mohsin Khan. 1985. "Income and Price Effects in Foreign Trade." In R. W. Joners and P. B. Kenen, eds., *Handbook of International Economics*, vol. II. New York: Elsevier.
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